

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

(Lightning Talk)

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Texas State University Libraries

Presented for JROST 2020, Joint  
Roadmap for Open Science Tools,  
December 2020



Repository



Identity Management System

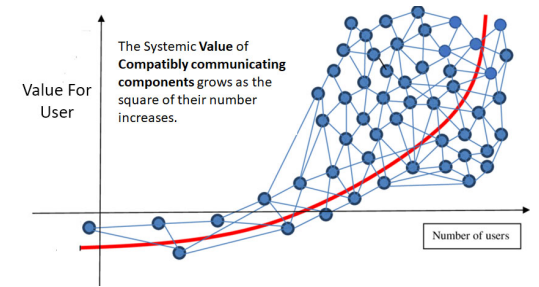
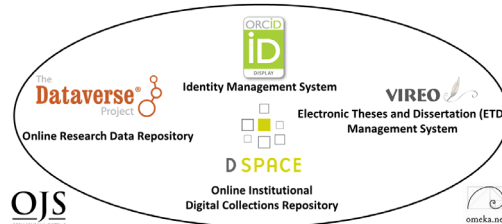
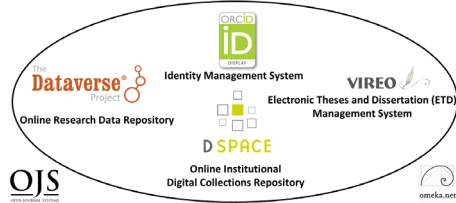


Elect

DSpace

Online Institutional  
Digital Collections Repository

# Can We 'Better' Enable Scholarly Research Network Ecosystem Possibilities on Global Levels?



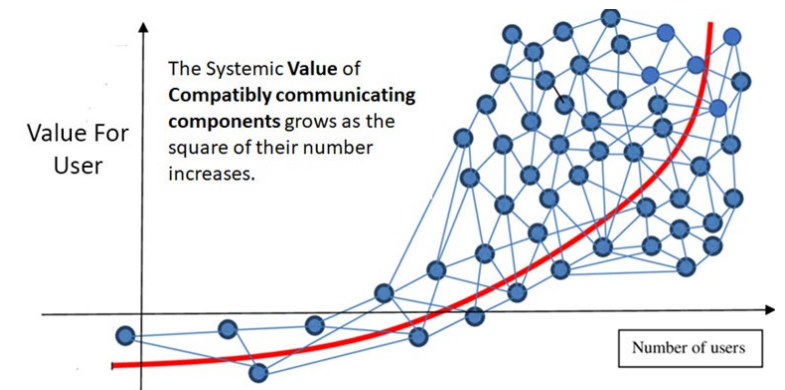
## Is it Time to Begin Thinking 'Systematically' About Empowering a Global Research University Community ?

# 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%.)

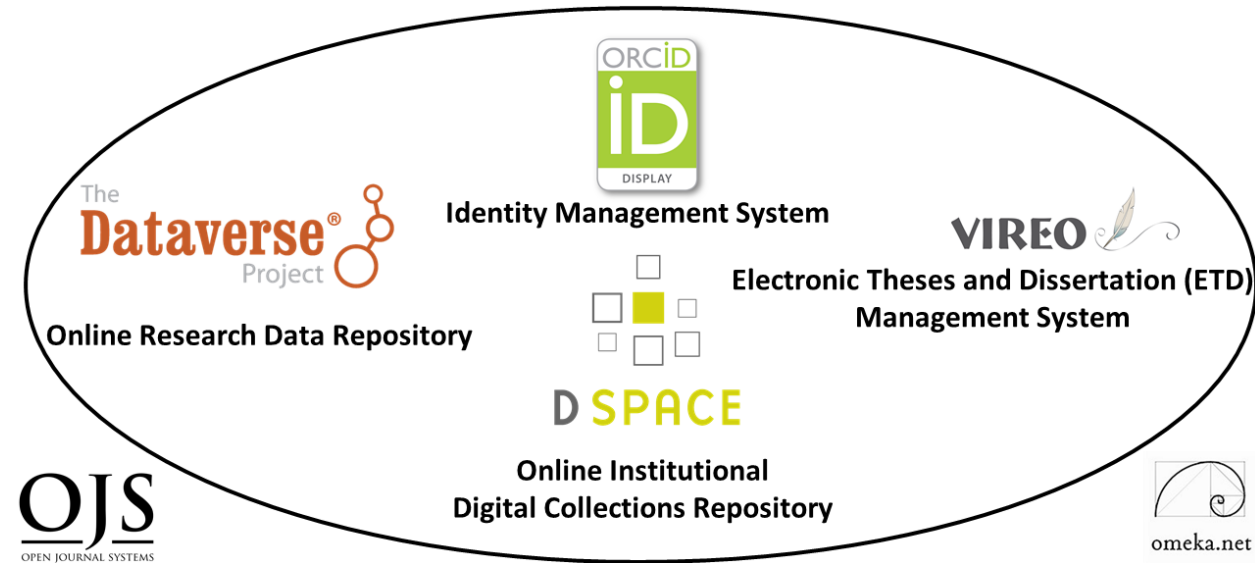
**Is it possible to Enable Top 2-3% Research Institutions Globally, ~ 1000 Institutions with Open Digital Research Ecosystems**

(Institutions beyond the few universities who already possess these)



# How do We Define an Open Digital Scholarship Research Ecosystem?

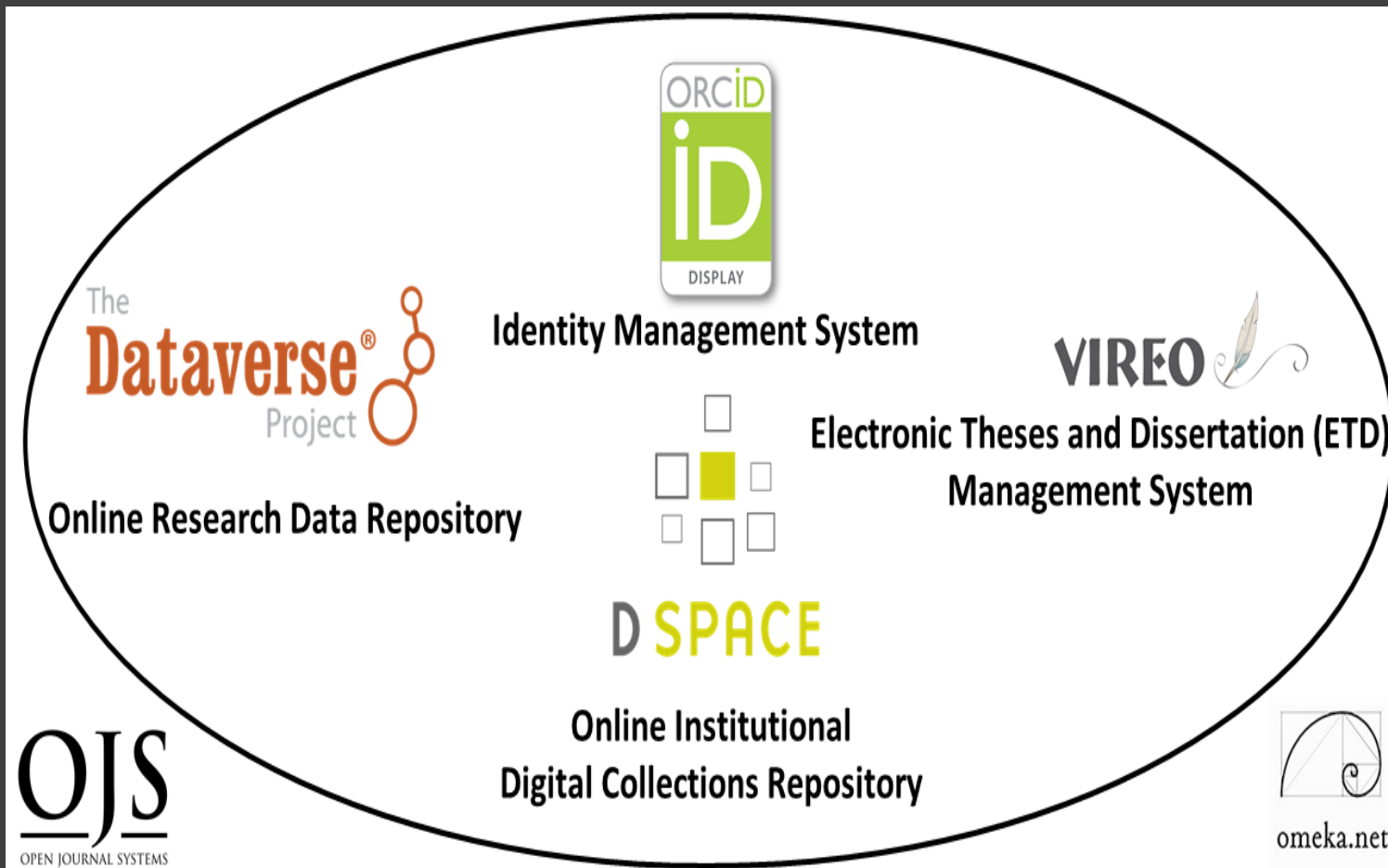
Network of Several Software Components to Enable Research Faculty and Graduate Students to Accelerate Research, Innovation and Global Collaboration



[Texas State University Digital Research Ecosystem](#)



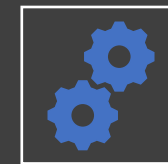
# General Software Characteristics of an Open Digital Scholarship Ecosystem



Open Source Software



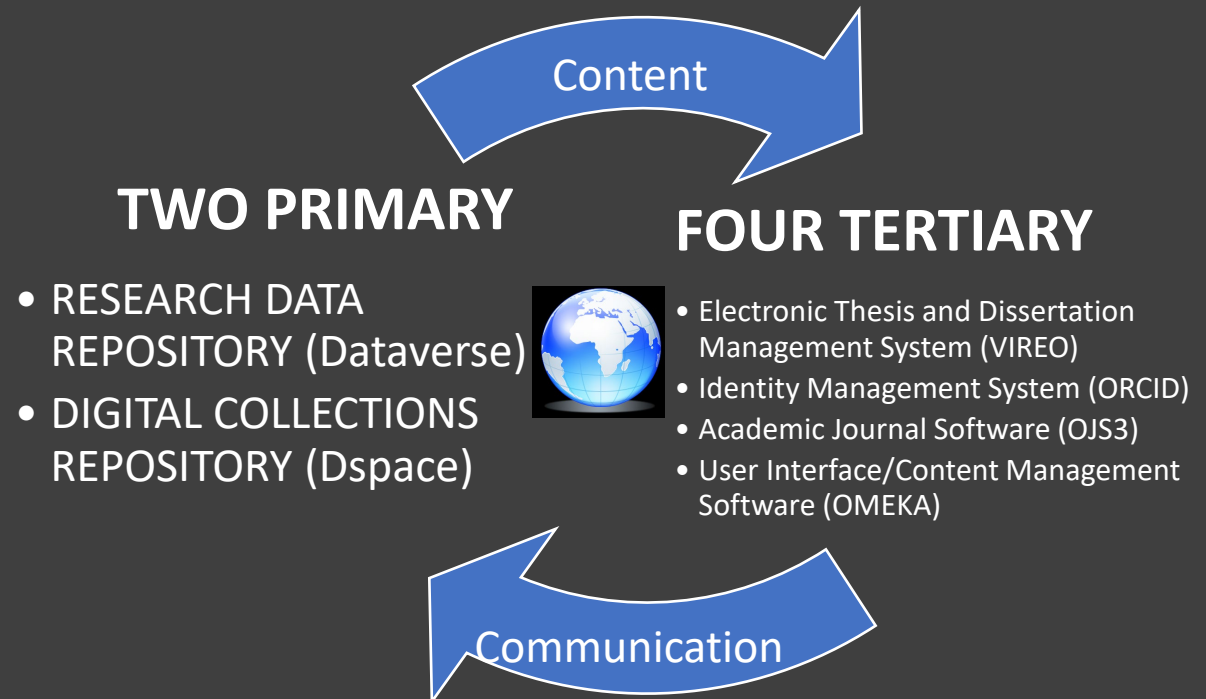
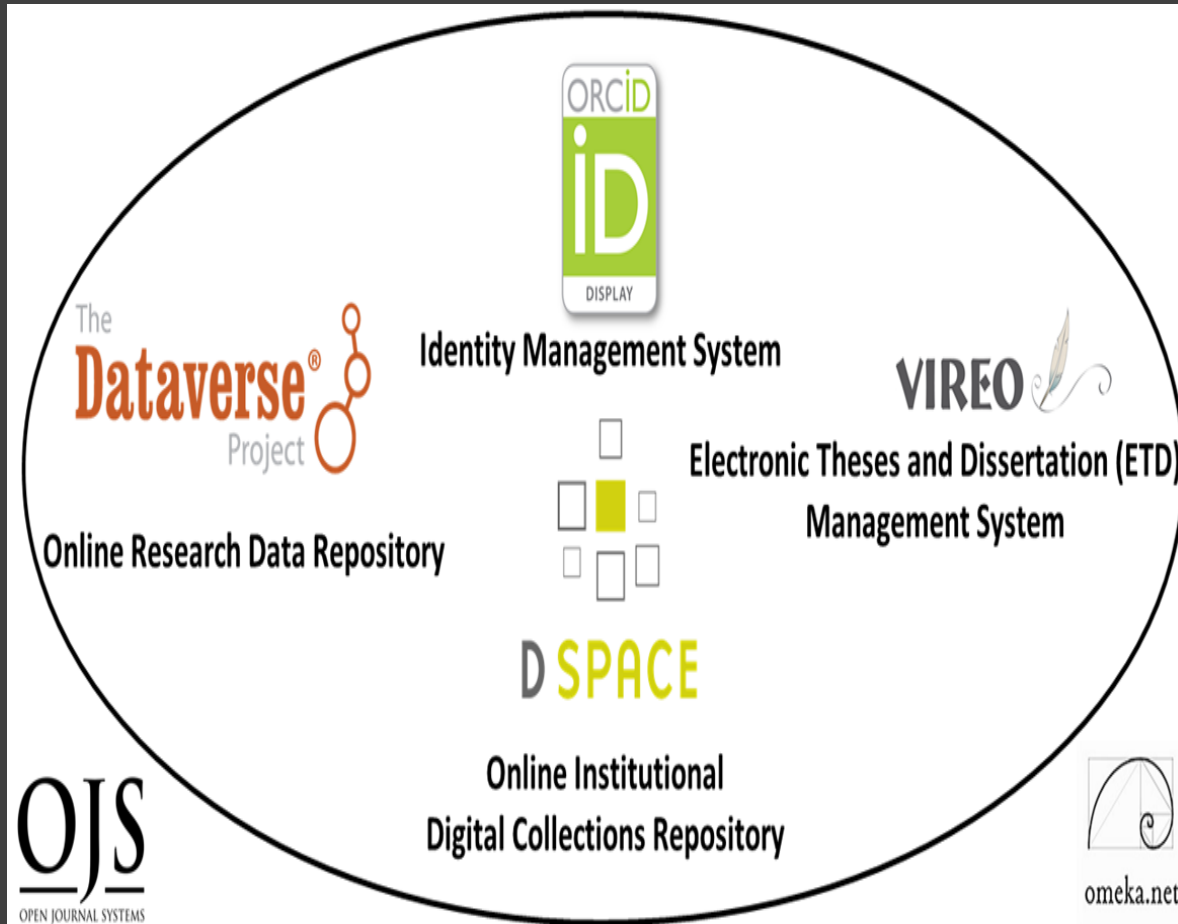
Active Developer  
Communities



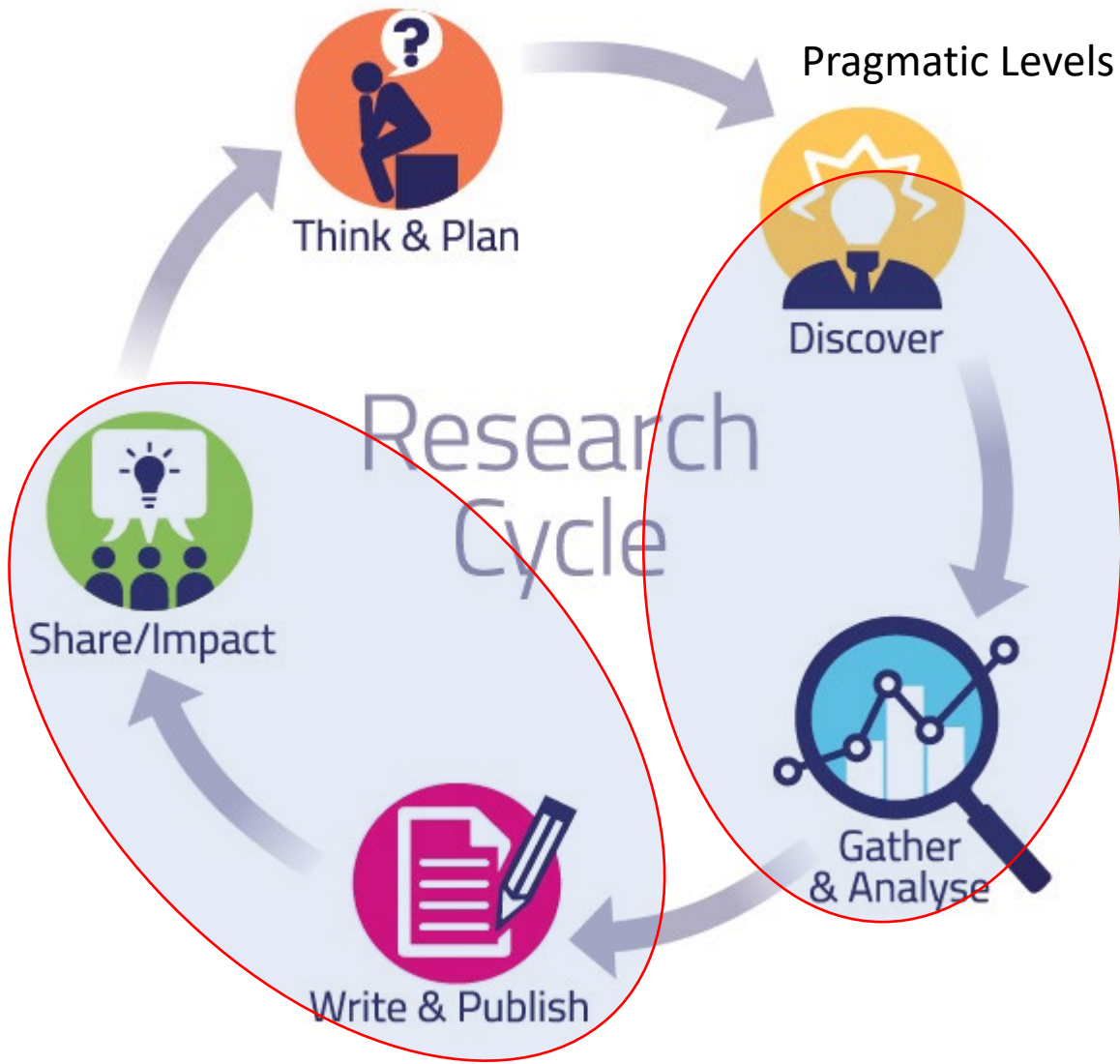
Customizable Components  
(Easy Configurability,  
Connectivity)

Texas State University Research Ecosystem  
([General Overview](#))

# What Classes of Open Source Software Components are needed to create a digital scholarship ecosystem?

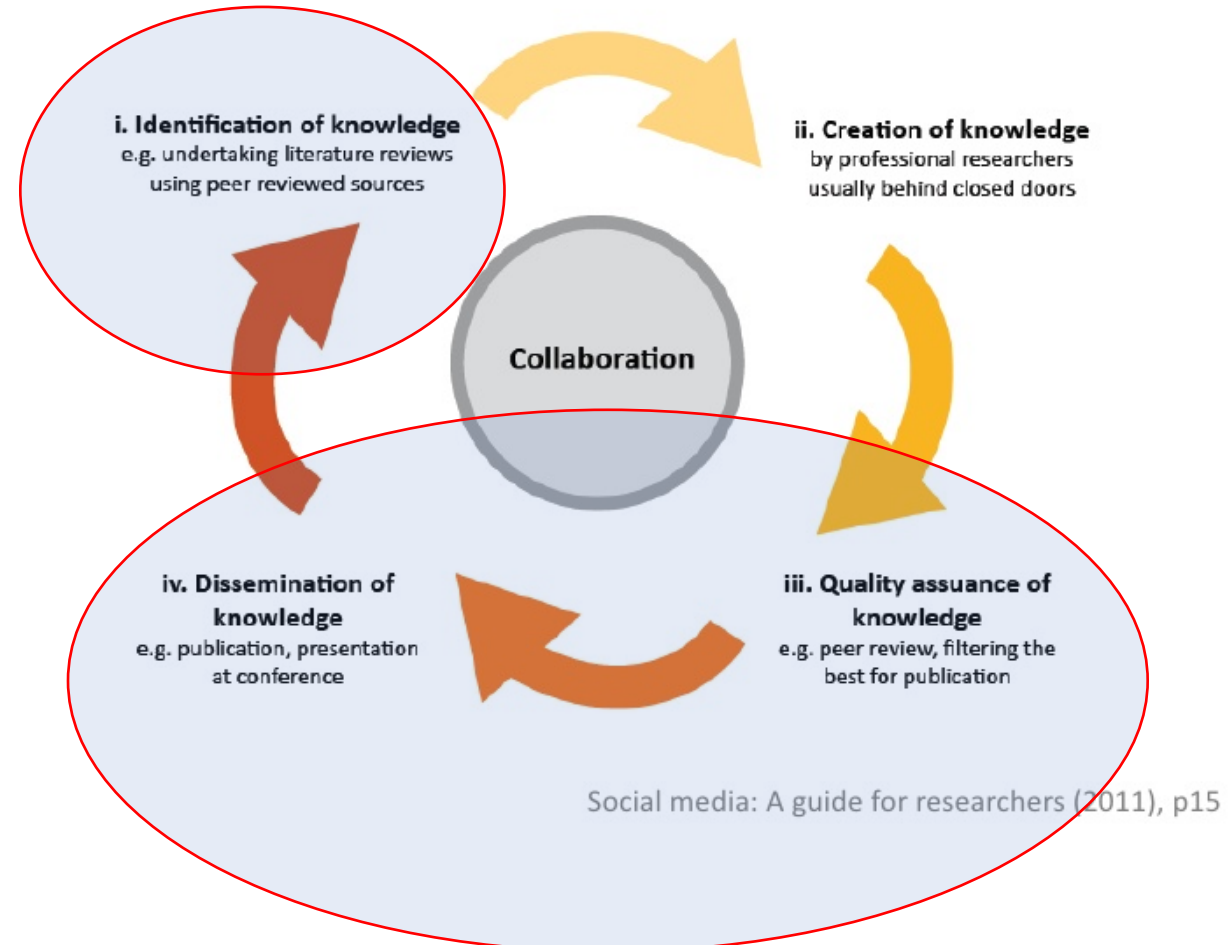


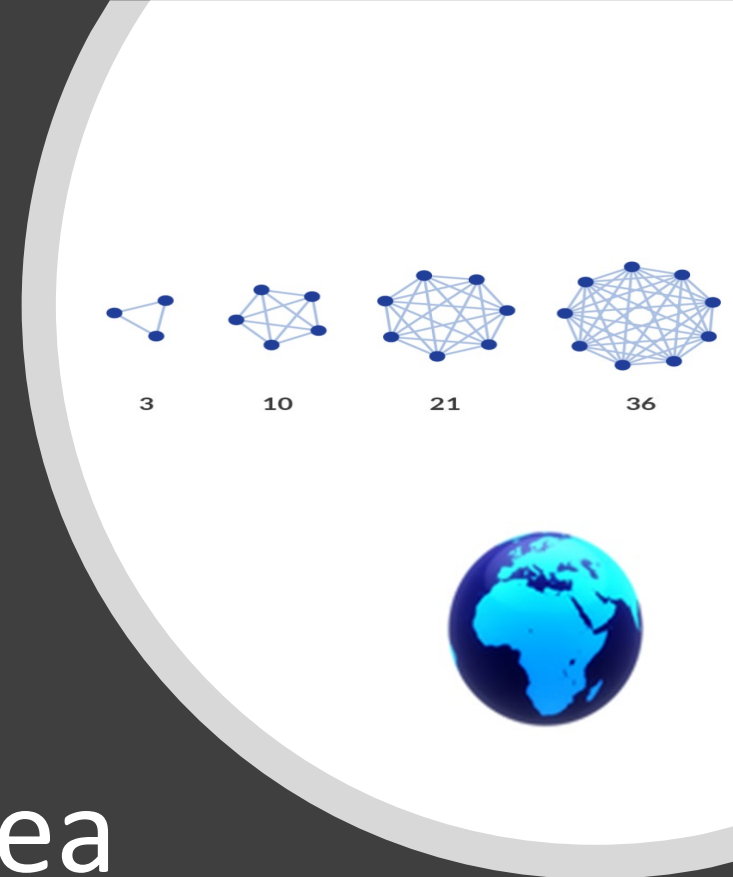
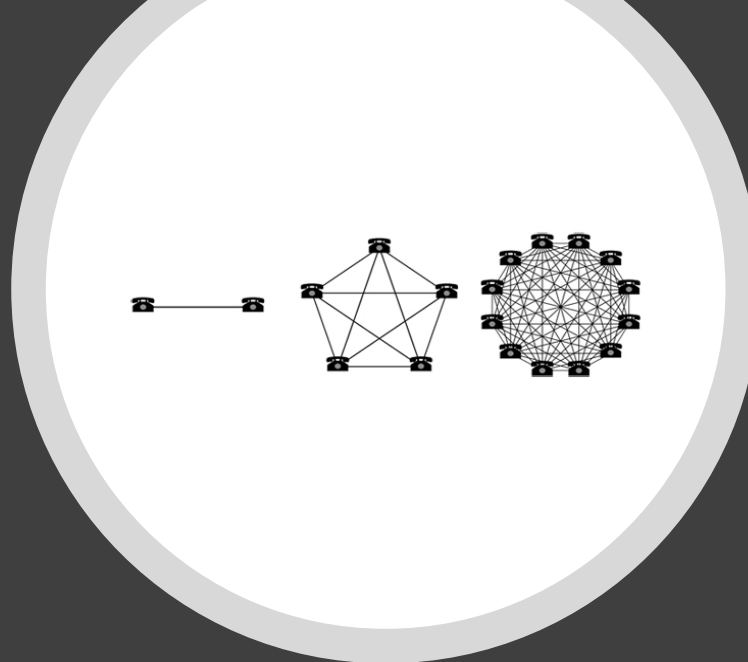
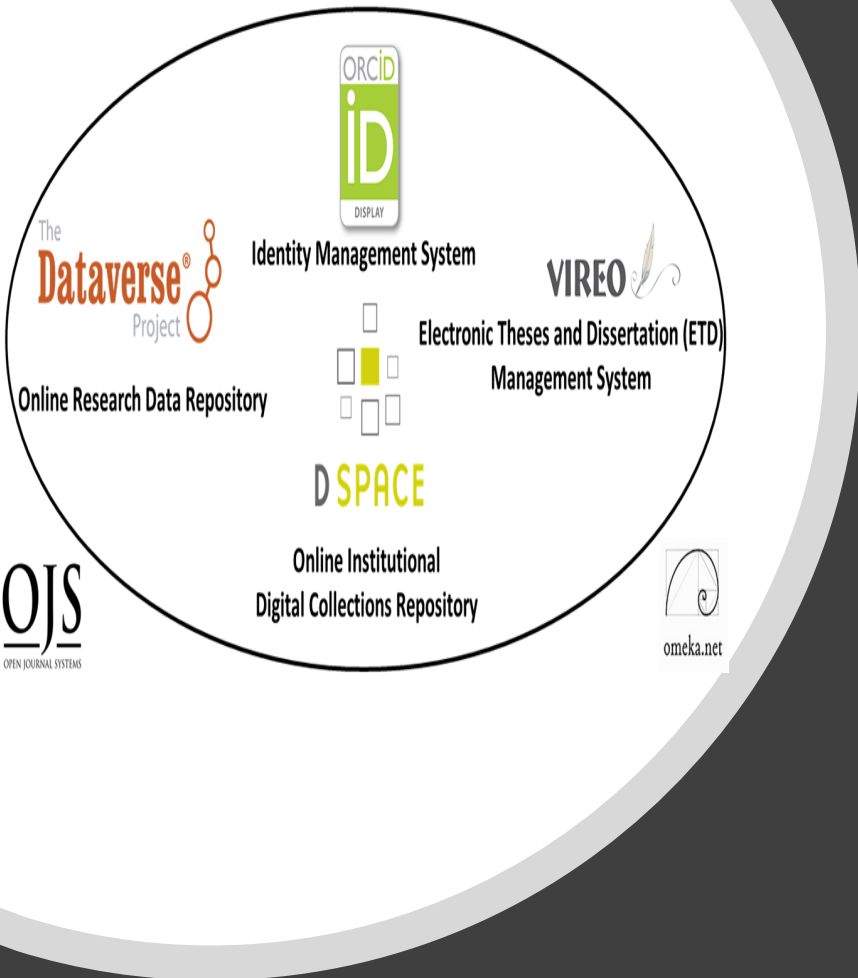
# Together, these Digital Ecosystem Components Enable the Academic Research Cycle



## The academic research cycle

## Abstract Levels





# Simple Larger Idea

Collocating Open-Source Digital Components in a Networked Research Environment Enables Larger Connections and/or Network Effects, Accelerating Research, Collaboration and Innovation ([Further Contextualization](#))

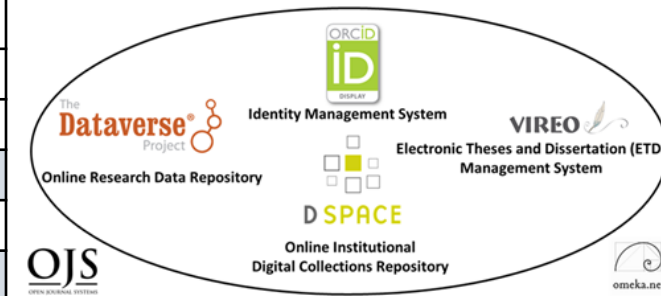
# Quantitative and Qualitative Assessment, 2014-2020

This Digital Research Ecosystem Shows Very Strong and Continued Potential for Growth

Research  
Ecosystem  
Implemented  
at Texas State  
University,  
2014-2019

System	2014	2015	2016	2017	2018	2019
<b>Downloads</b>						
DSpace	326,762	318,742	385,163	341,224	972,359	1,010,349
ETDs	136,985	158,240	200,373	328,420	470,437	505,658
Dataverse	n/a	n/a	n/a	455	3,451	2,043
<b>Number of Items</b>						
DSpace	1,340	1,437	1,546	1,660	2,135	2,720
ETDs	967	1,174	1,326	1,581	1,789	2,218
Dataverse	n/a	n/a	n/a	28	33	53
<b>ORCID IDs</b>						
ORCID	101	190	316	438	545	669
<b>Hosted Journals</b>						
OJS	1	1	2	2	3	4

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

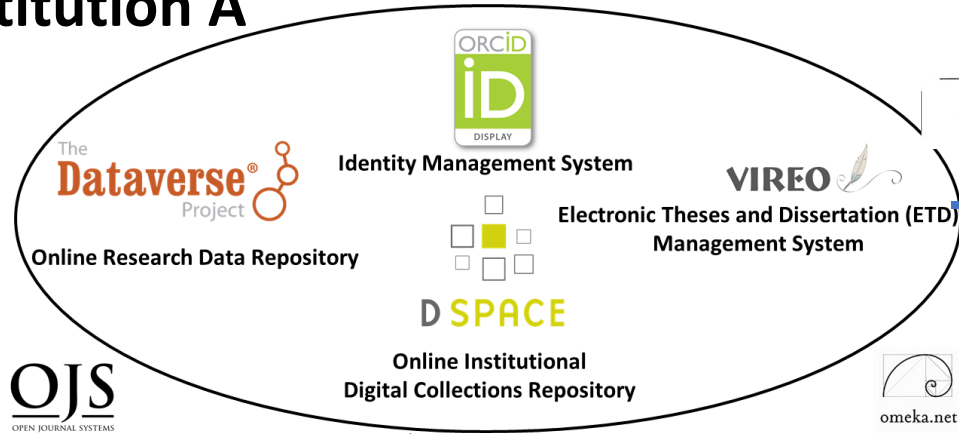


LibQual Biannual Survey  
2013-2019, Faculty and  
Student System  
Perceptions, Comments

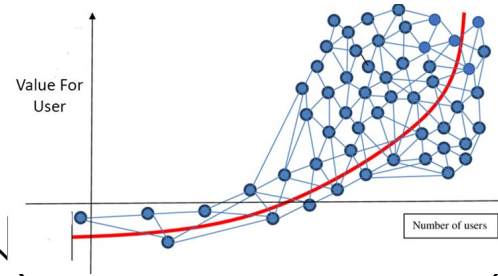


# Many Beneficial Internal and External Effects of Such a System

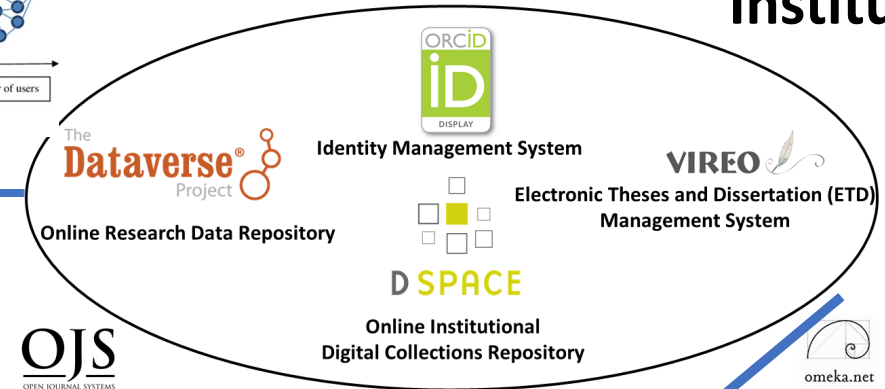
**Research  
Institution A**



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

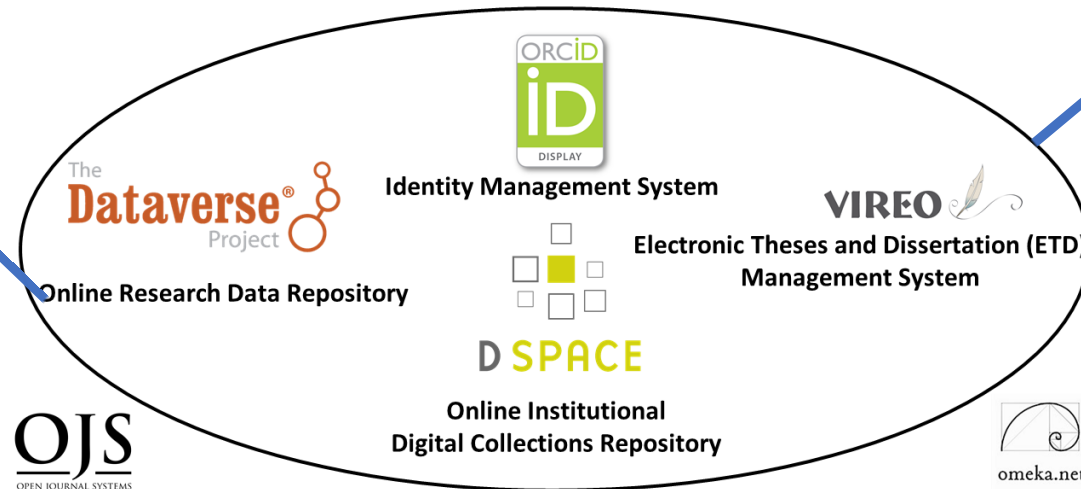


**Research  
Institution B**



Externally, this ecosystem enables collaborative opportunities among Researchers and Research Institutions

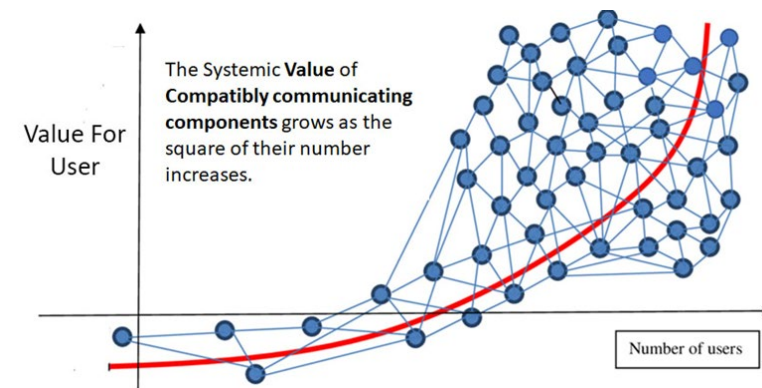
**Research  
Institution C**



# 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.



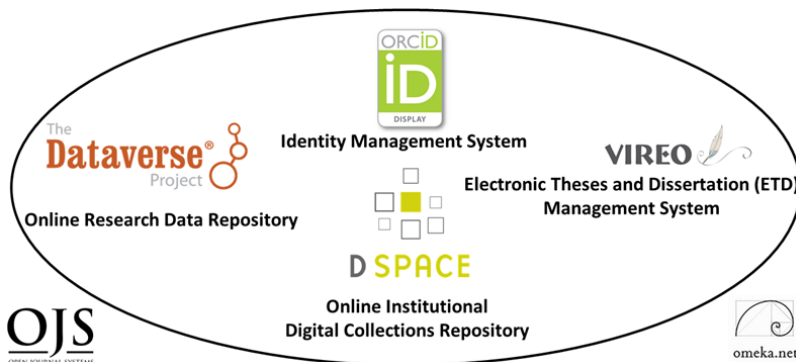
# One Server Per Research University Initiative

## 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!

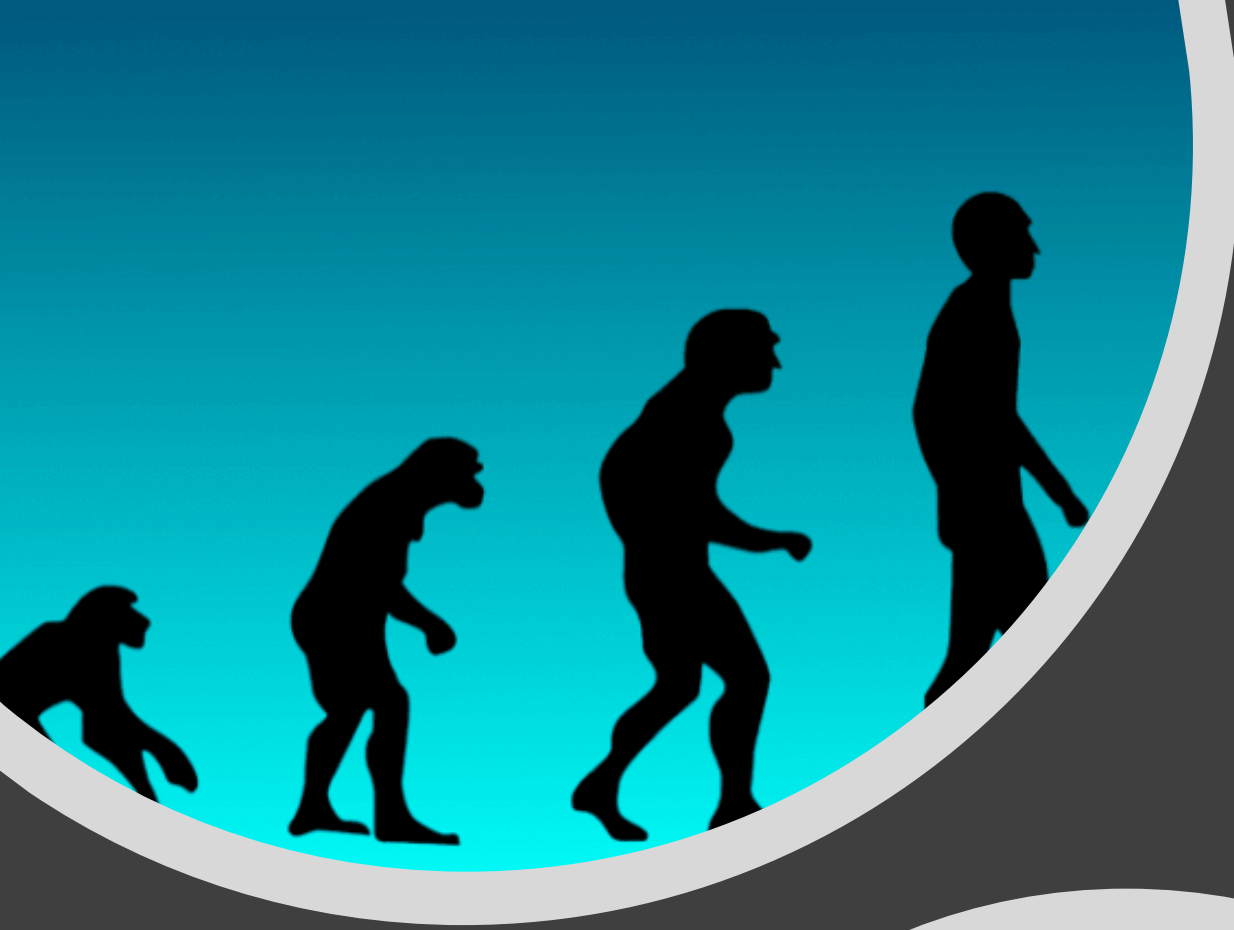


# Summary Statements

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 21<sup>st</sup> 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

Uzwysyn, R. 2020 [Developing an Open Source Digital Scholarship Ecosystem \(Preprint\)](#). ICEIT2020. Oxford, UK. February, 2020

[Open Digital Research Ecosystems: How to Build Them and Why](#). *Computers in Libraries*, (40) 8. November 2020.

[Digital Research Ecosystems for Open Science \(Presentation\)](#). AI for Data Discovery, Reuse & Open Science Symposium. Carnegie Mellon University. October 20, 2020.

[Open Source Tools for a Digital Research Ecosystem \(Interview\)](#). *Campus Technology C-Level View*. Feature Interview. May 11, 2020.

[Developing a Digital Scholarship Research Ecosystem. \(PDF\)](#) Association of Southeastern Research Libraries Member's Webinar, April 29, 2020.

### **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 \(ORCID\)](#)

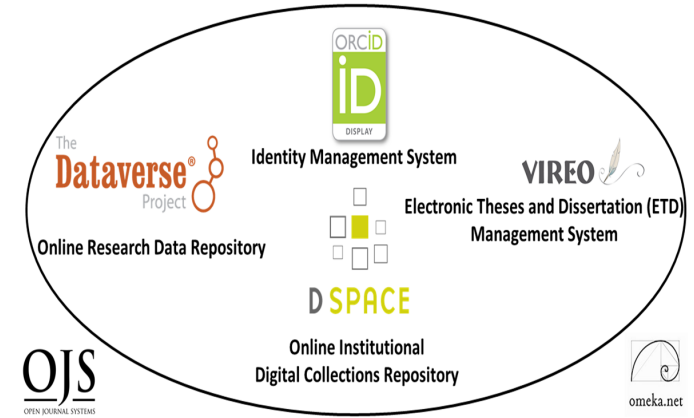
[Texas State Electronic Thesis and Dissertation Management \(VIREO\)](#)

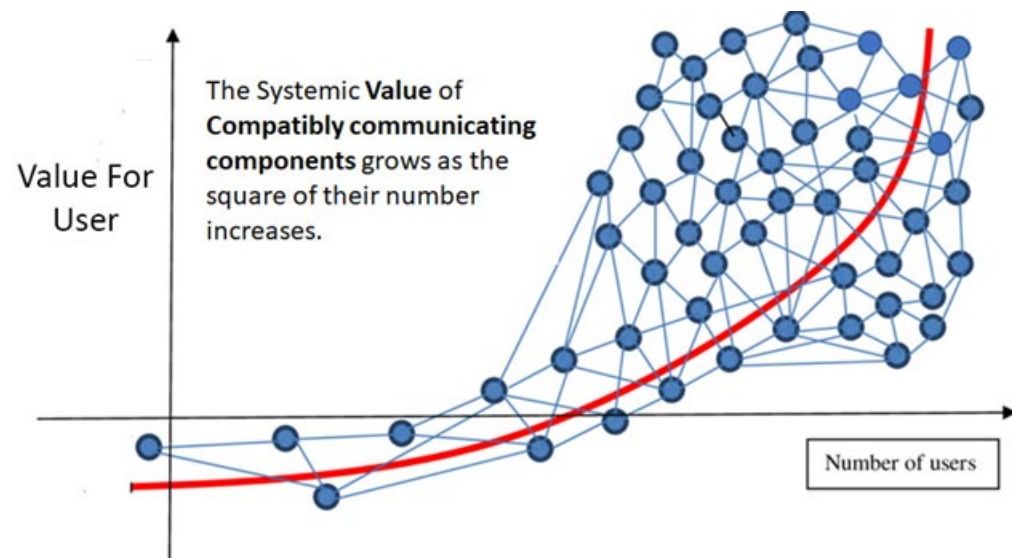
[Open Journal Systems @ Texas State](#)



# 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/>





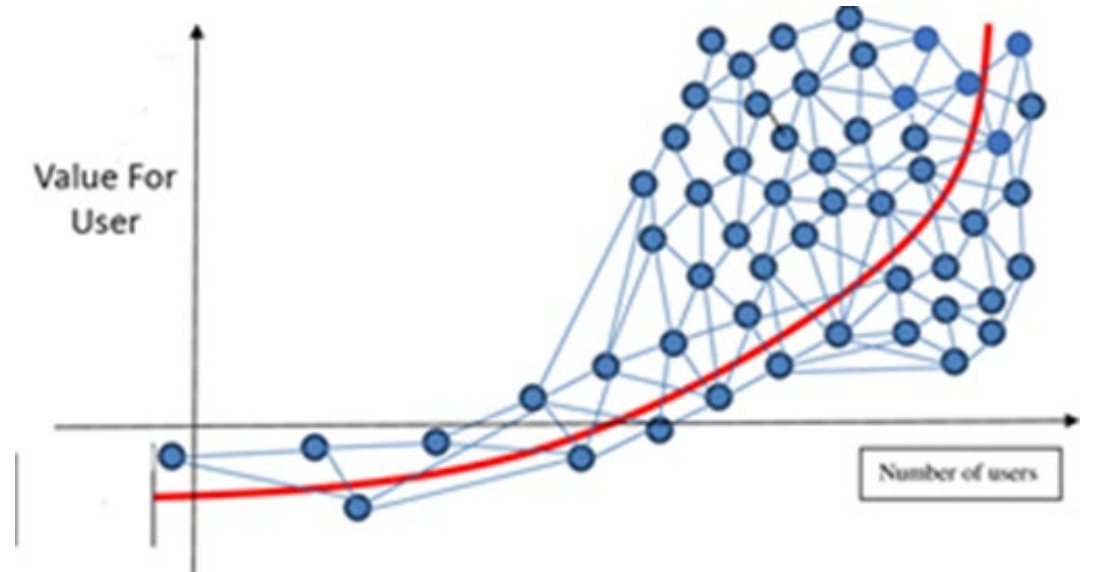
# Questions and Comments



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[ruzwyshyn@txstate.edu](mailto:ruzwyshyn@txstate.edu), 512-245-5687  
<http://rayuzwyshyn.net>

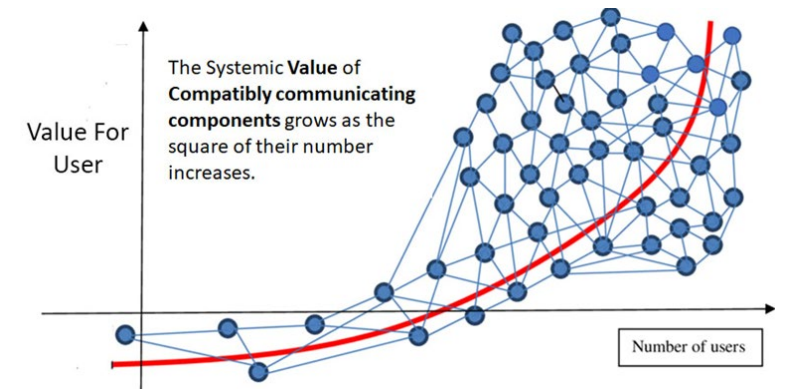


# Future Pathways Networked Global Scholarly Research Environment



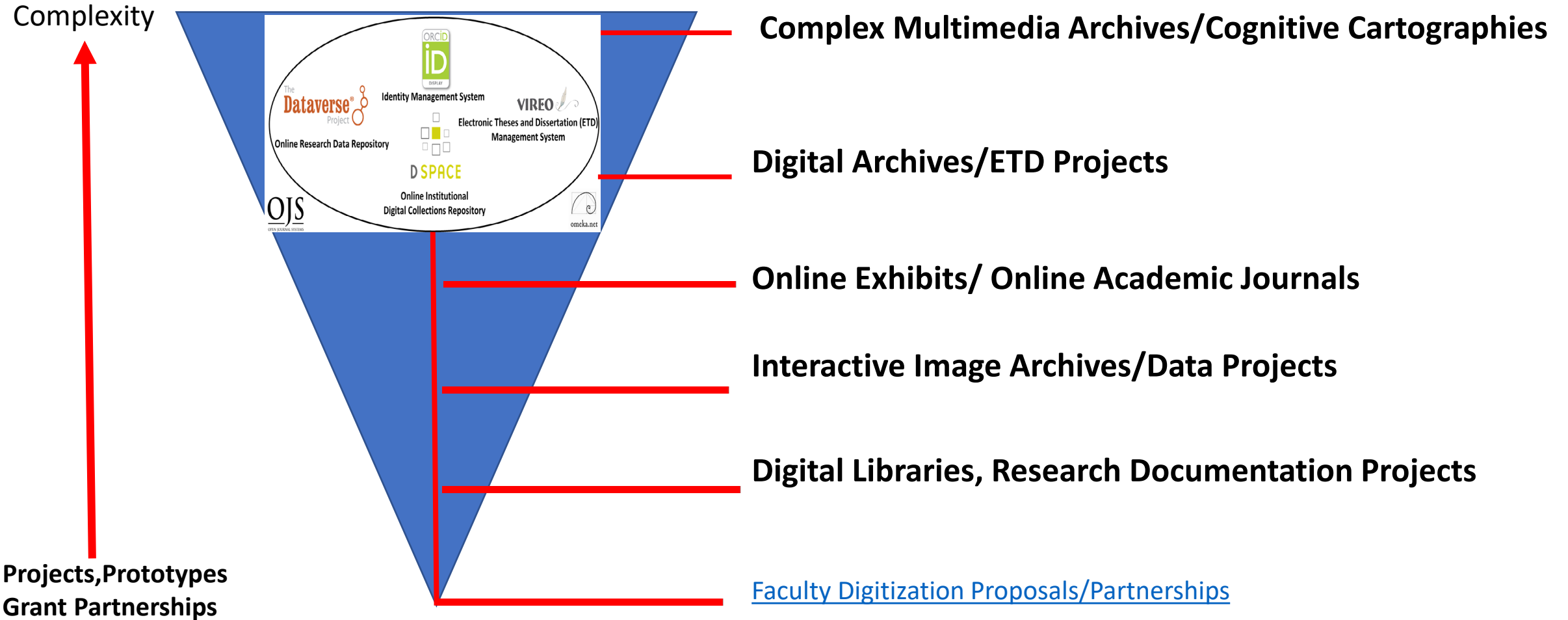
# Research Universities and Digital Research Ecosystems

- **~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



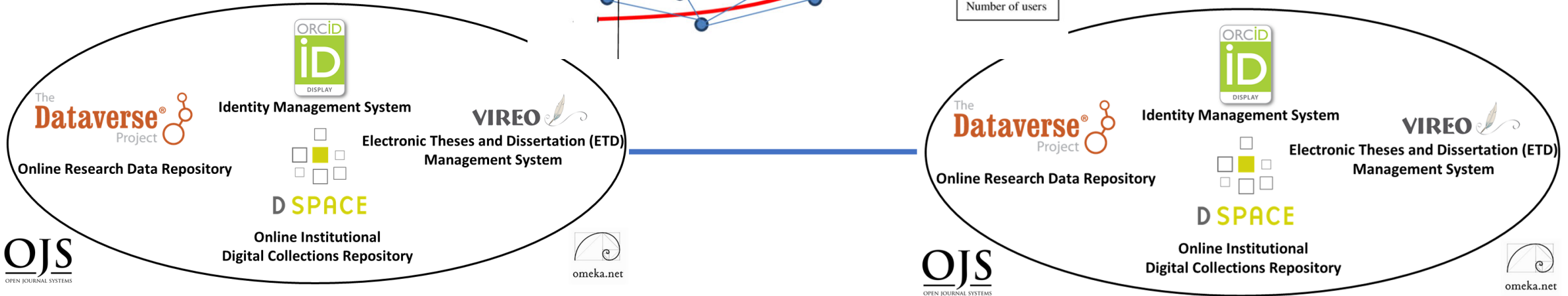
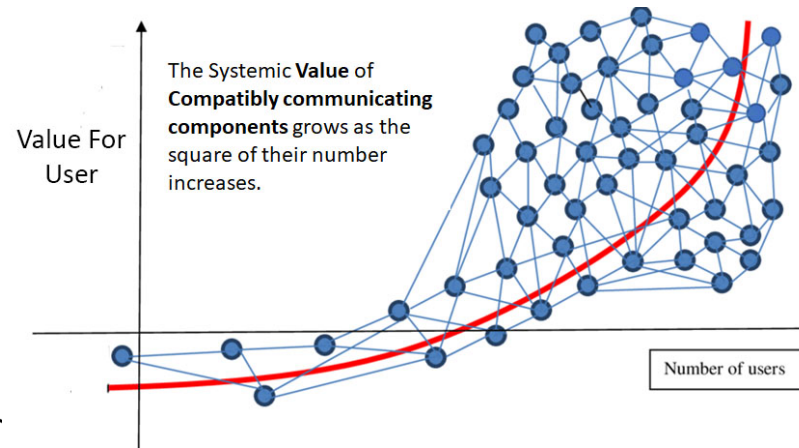
# Together, These Research Ecosystem Components

Open Amazing Possibilities For Digital Scholarship & Collaboration



# Network Effects

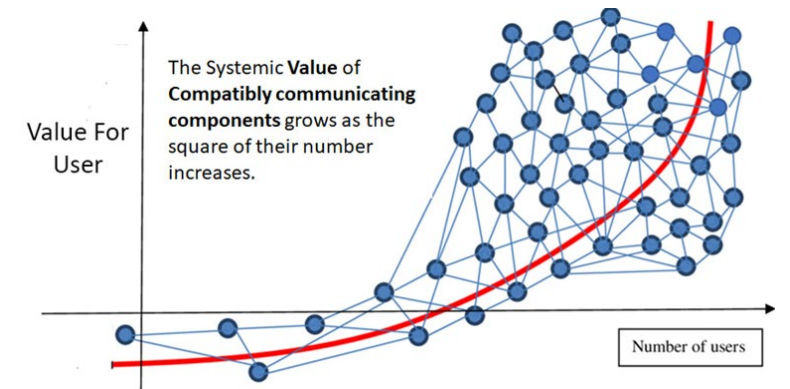
Both In and Between Individual Components  
and In and Among Component Networks



- 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

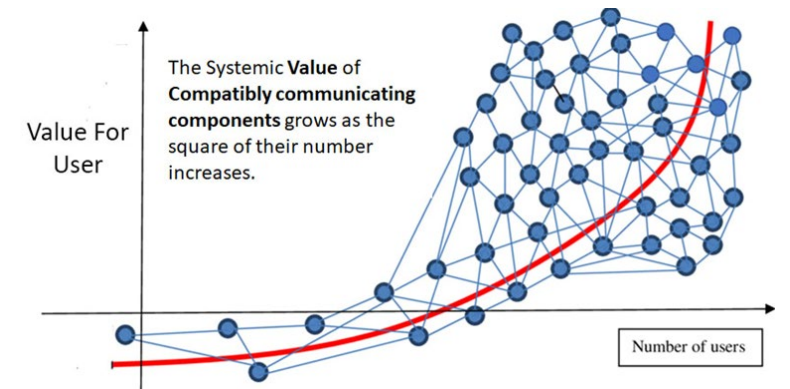
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- **26,000-40,000** Universities Globally. Research Universities 2.7% - 4.2% of all universities worldwide. Highest by Country: **US 156**, UK 76, Germany 45, Japan 44.
- Other Top 2-3% Research Institution Academic Libraries Globally, 1000 Institutions beyond the US and Canada. This represents the other 90% of Research Libraries Globally

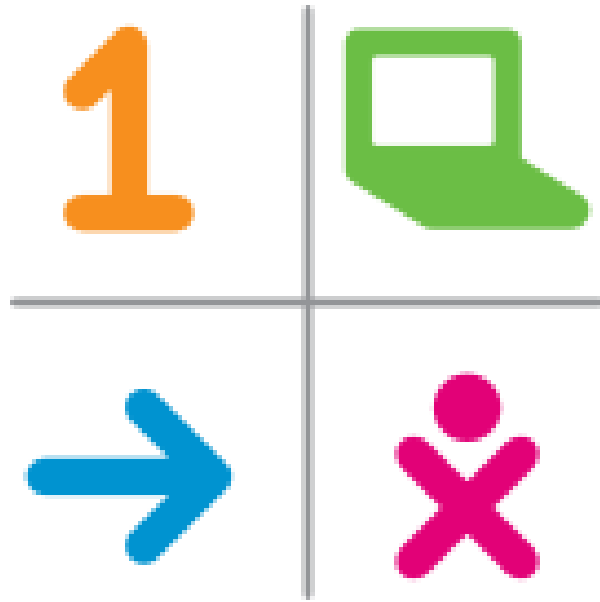


# Research Universities and Digital Research Ecosystems

- **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



# One Laptop Per Child Initiative

Dreamed up mid-late 90's, Launched 2005

Antecedent 'Big Idea' Model

MIT Media Lab Director Nicholas Negroponte

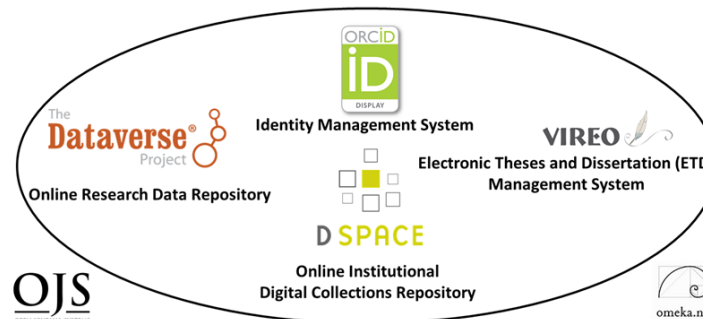
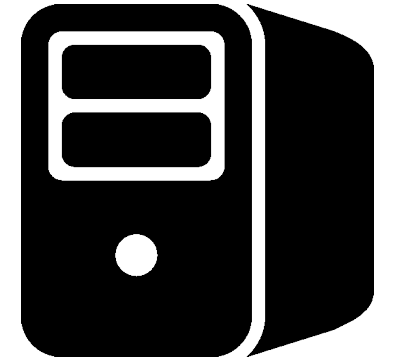
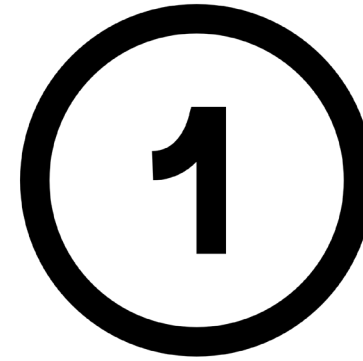
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- **Vision:** Give each child in world access to a laptop with open source software for less than 100.00 \$US/laptop
- Gage Global Effects For Education
- Why not try something similarly worthy, noble and significant for academic research institutions 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!



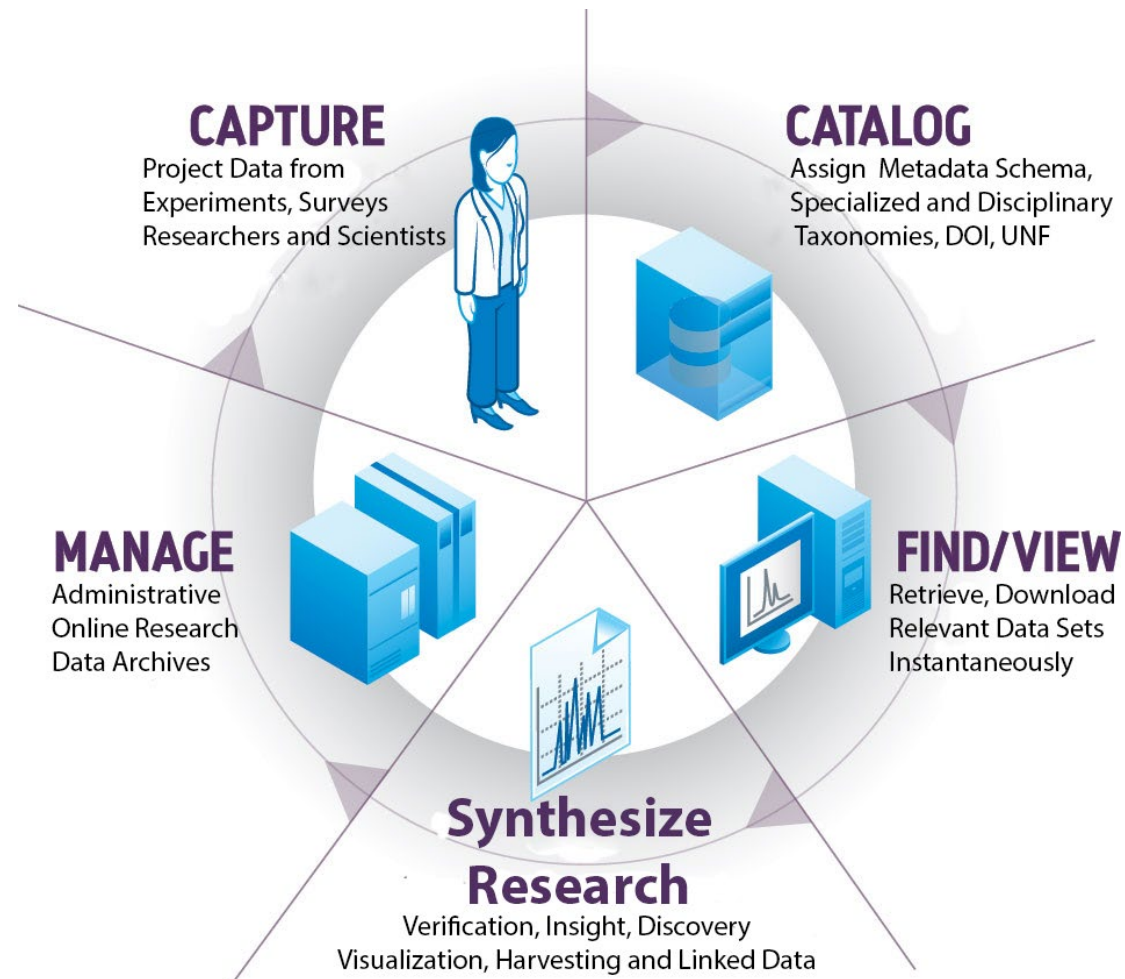
# #1 Component for Open Science, Research Data Repository



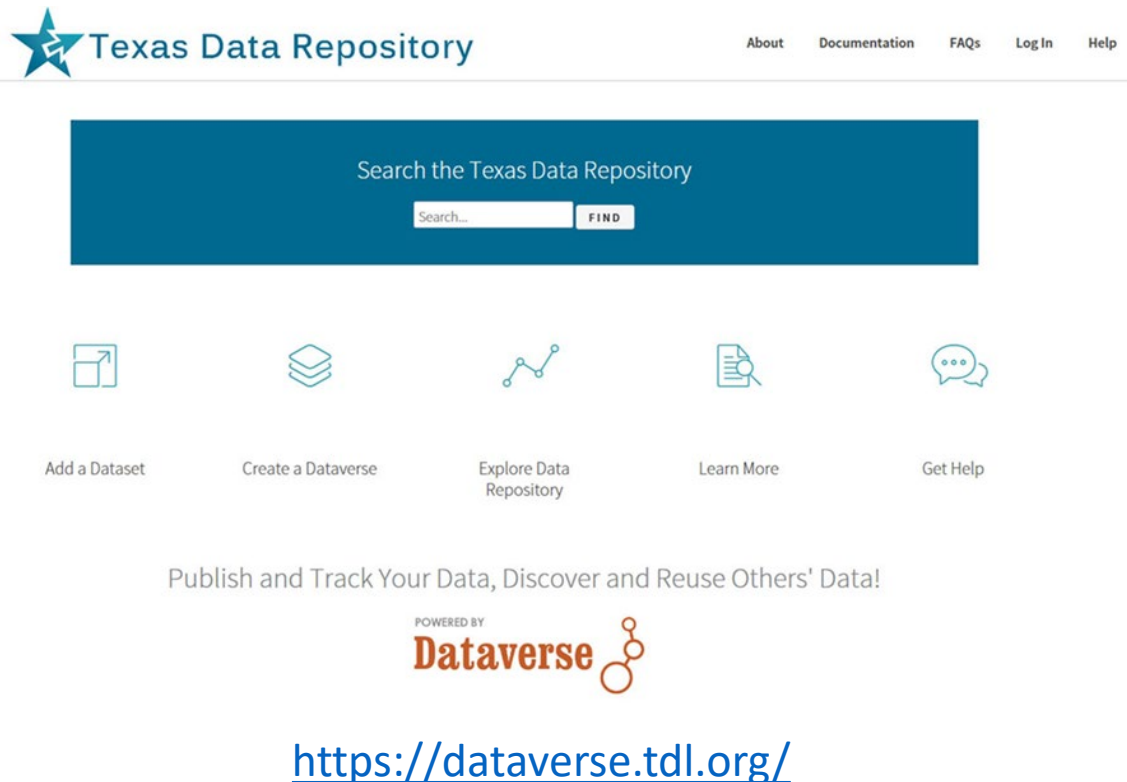
<https://dataverse.tdl.org/dataverse/txstate>

# Research Data Repository

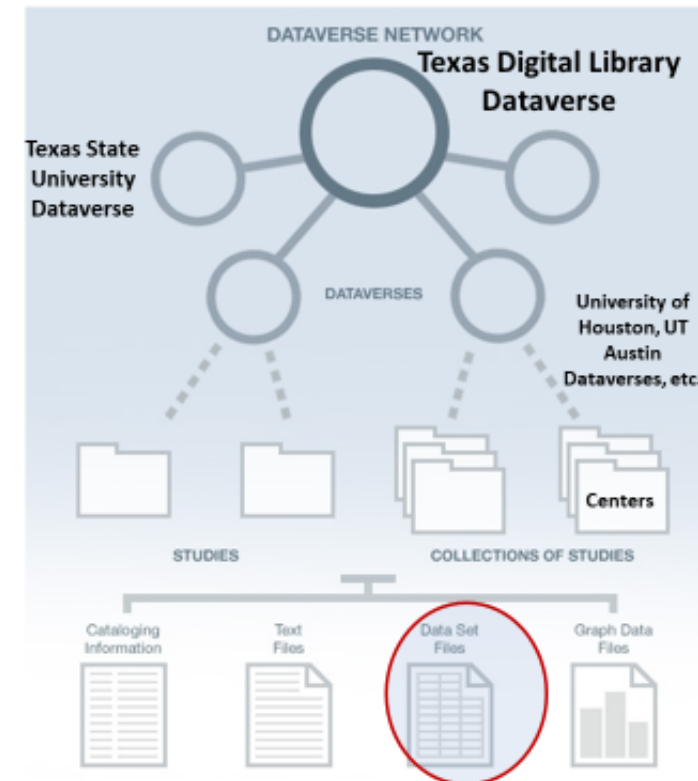
<https://dataverse.tdl.org/dataverse/txstate>



# Dataverse can be configured as Single Instance or as a Consortial Model



## Dataverse Architecture (Consortial)



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



# #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):

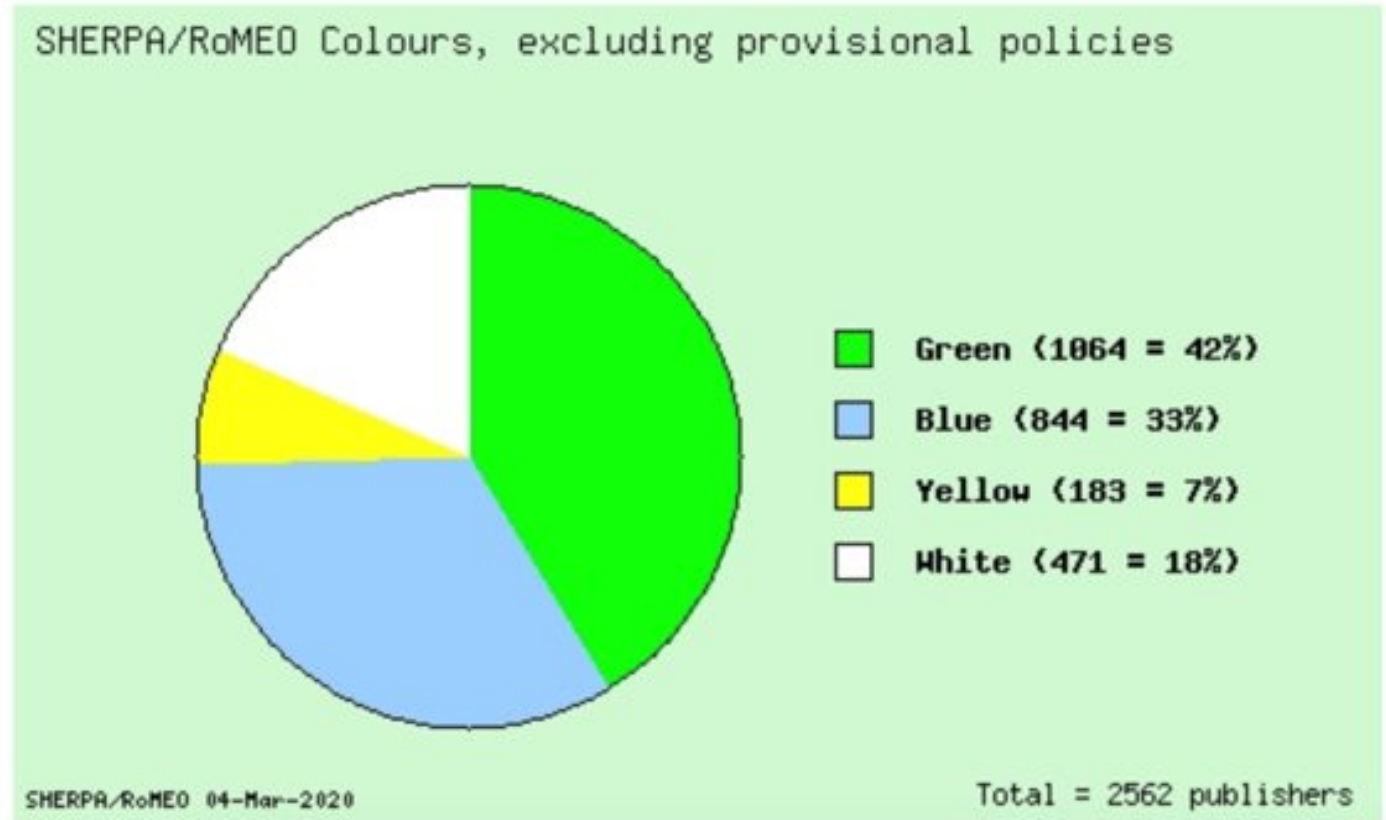
- Pre-prints
- Faculty Publications
- White Papers
- Conference Presentations
- Graduate Student Theses and Dissertations

A Vast Majority of Publishers Allow Digital Archiving in some form. (82% from 2562 publishers)

March 2020 Sherpa/Romeo Copyright Policies

RoMEO colour	Archiving policy	Publishers	%
<a href="#">green</a>	Can archive pre-print and post-print	1064	42
<a href="#">blue</a>	Can archive post-print (ie final draft post-refereeing)	844	33
<a href="#">yellow</a>	Can archive pre-print (ie pre-refereeing)	183	7
<a href="#">white</a>	Archiving not formally supported	471	18

Summary: **82%** of publishers on this list formally **allow** some form of self-archiving.



Google Scholar search results for "athermal annealing of low-energy boron". The search bar shows the query and the results count: "About 105,000 results (0.36 seconds)". The top result is "Athermal annealing of low-energy boron implants in silicon" by Donnelly, David W., et al.

dc.contributor.author	Donnelly, David W.
dc.contributor.author	Covington, B. C.
dc.contributor.author	Grun, J.
dc.contributor.author	Fischer, R.P.
dc.contributor.author	Peckerar, M.
dc.contributor.author	Felix, C. L.
txstate.contributor.author	Donnelly, David W., Southwest Texas State University, Dept. of Physics
txstate.contributor.author	Covington, B. C., Southwest Texas State University
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dc.title	Athermal annealing of low-energy boron implants in silicon
dc.language.iso	en_US

Access  
Find  
Search Engine  
Optimization

# Primary Use Case Value Application of Structured Metadata Schema for Search Engine Optimization

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#2 of 105,000  
Immediately  
Available

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dc.subject	"Athermal annealing", "baron implants", silicon
dc.title	Athermal annealing of low-energy boron implants in silicon
dc.language.iso	en_US

Download button highlighted in red. Below it, a file icon and metadata: Name: Donnelly-2001 APL ... Size: 322.5Kb Format: PDF. A "View/Open" link is also visible.

## 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:

Original publication information [Appl. Phys. Lett. 78, 2000 \(2001\)](#)

### Recommended Citation:

Donnelly, David W. and Covington, B. C. and Grun, J. and Fischer, R.P. and Peckerar, M. and Felix, C. L., "Athermal annealing of low-energy boron implants in silicon" (2001). *Applied Physics Letters*.  
<https://digital.library.txstate.edu/handle/10877/4675>

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Title	dc.title	Athermal annealing of low-energy boron implants in silicon	en_US
Language	dc.language.iso	en_US	en_US

Dublin Core  
Metadata

Access Points

Findability

Search Engine  
Optimization (SEO)

Google

athermal annealing of low-energy boron



Web

Shopping

Images

Videos

News

More ▾

Search tools

About 105,000 results (0.36 seconds)

### Scholarly articles for athermal annealing of low-energy boron

Athermal annealing at room temperature and ... - Shao - Cited by 19

Athermal annealing of low-energy boron implants in ... - Donnelly - Cited by 10

Hydrogen passivation of silicon carbide by low-energy ... - Achziger - Cited by 53

### Athermal annealing of low-energy boron implants ... - Scita...

[scitation.aip.org/content/.../1.1359784?...](#) ▾ American Institute of Physics ▾

by DW Donnelly - 2001 - Cited by 10 - [Related articles](#)

Athermal annealing of low-energy boron implants in silicon. D. W. Donnellya) and B. C. Covington. Department of Physics, Southwest Texas State University, ...

### Athermal annealing of low-energy boron implants in silicon

[digital.library.txstate.edu > ... > Faculty Publications-Physics](#) ▾

by DW Donnelly - 2001 - Cited by 10 - [Related articles](#)

Athermal annealing of low-energy boron implants in silicon. Donnelly, David W., Southwest Texas State University, Dept. of Physics; Covington, B. C., Southwest ...

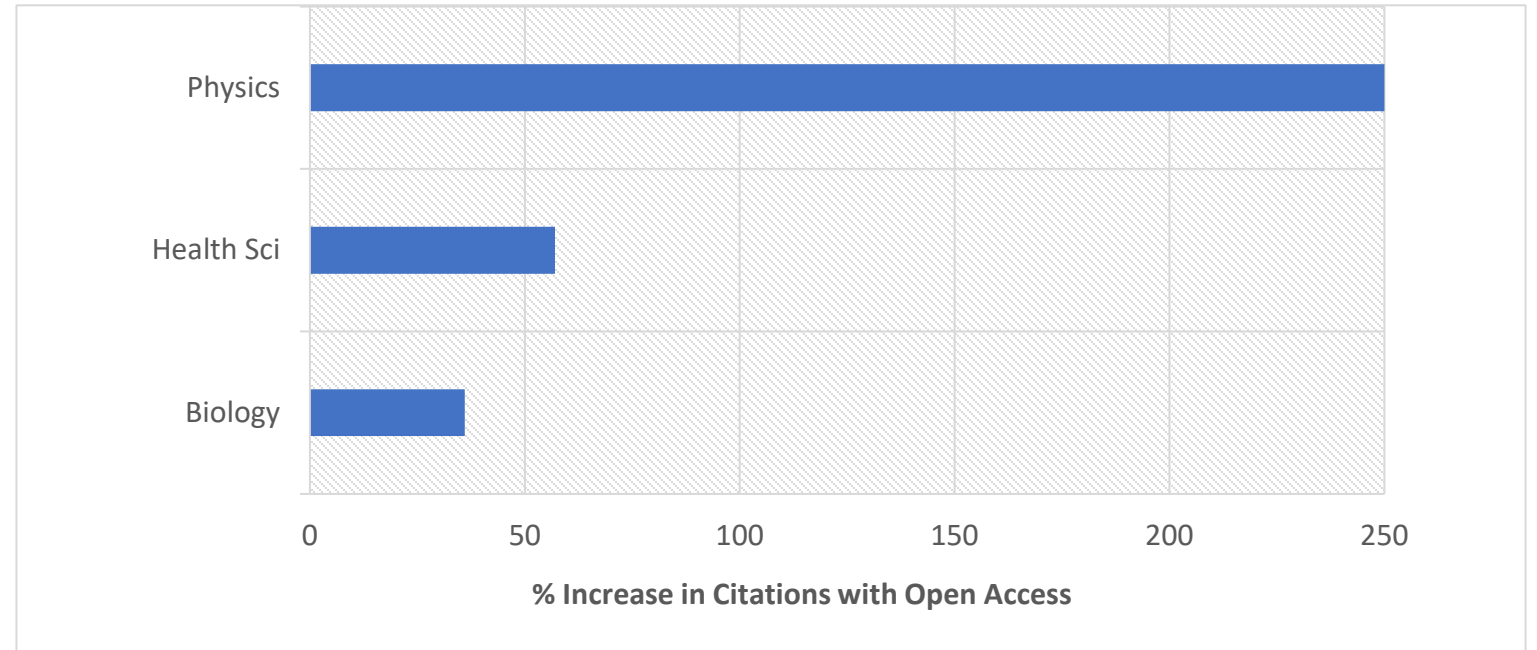
### Athermal annealing at room temperature and enhanced ...

[connection.ebscohost.com/.../athermal-annealing-room-temperature-enh...](#) ▾

Athermal annealing of implantation damage induced by low energy boron implants at room temperature was observed after coimplantation and such annealing ...

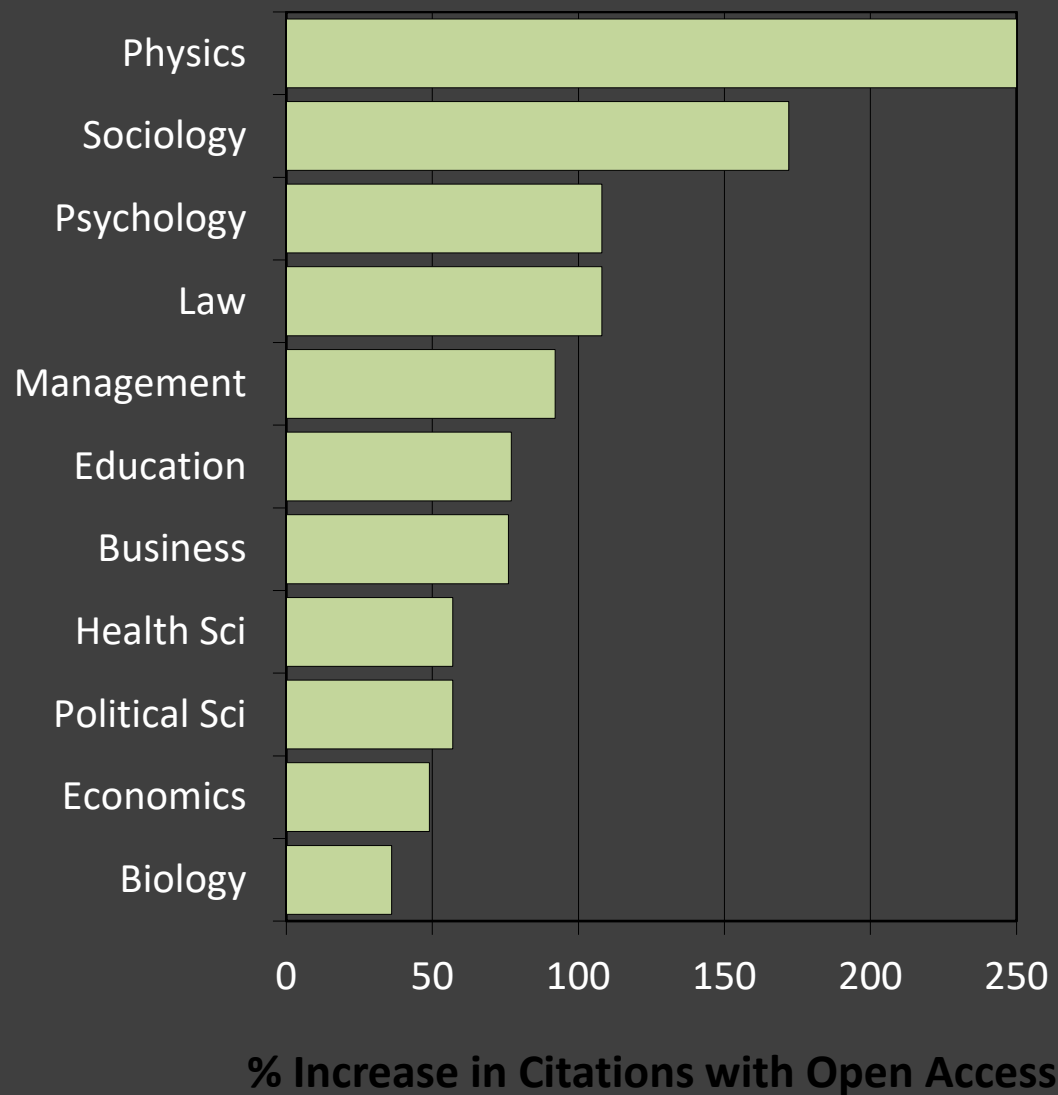
#2 of 105,000  
Immediately  
Available

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%**

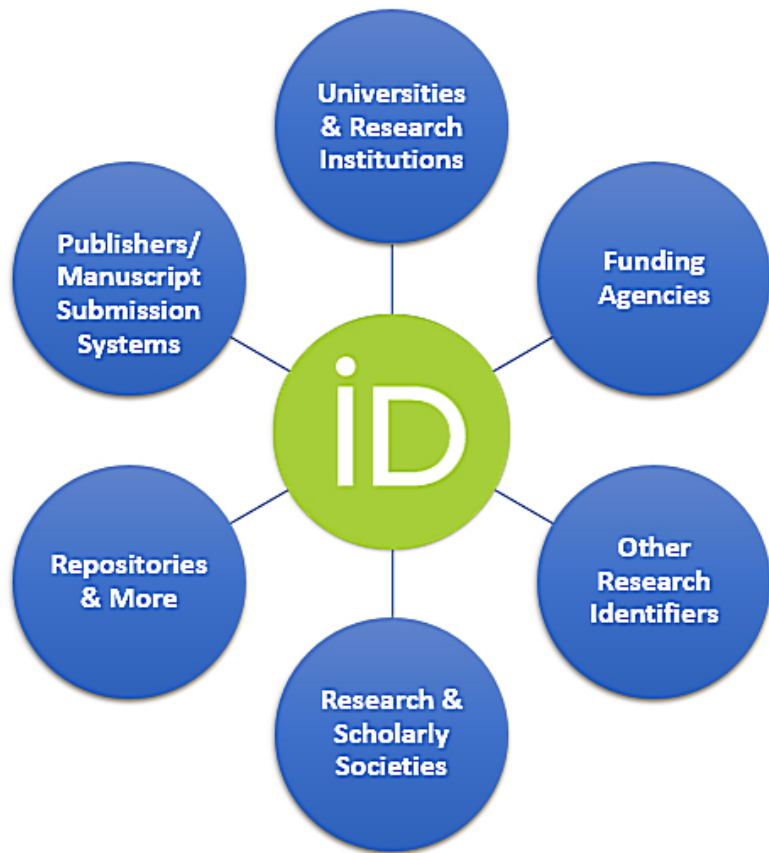
(Data: Stevan Harnad and Heather Joseph,  
2014)

# 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



ORCID is a hub connecting the research landscape



## Researcher Identity Management System

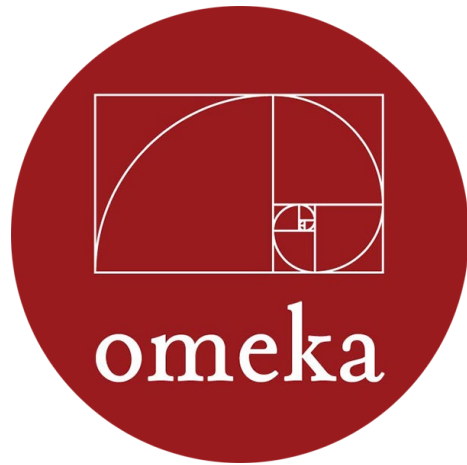
- Gives Researchers Unique Number (ORCID ID) Connecting and Disambiguate Scholars names:

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 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**

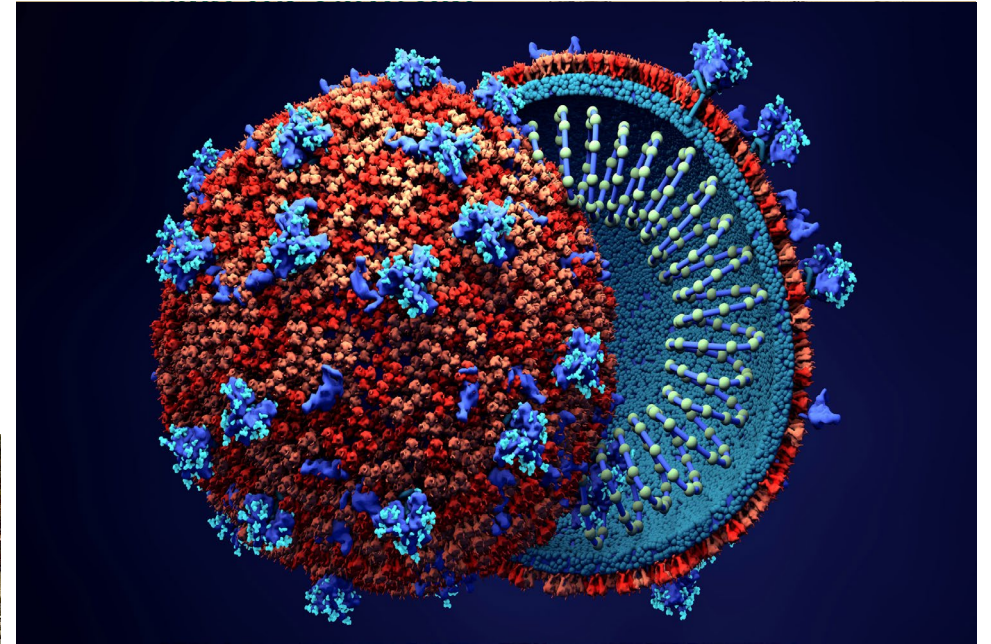
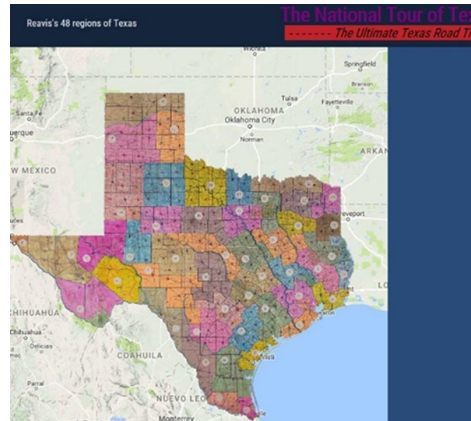
Provides a front end gateway for more complex research projects  
- linking text, image media and datasets and acting as a front end for connecting components.



**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



# 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**

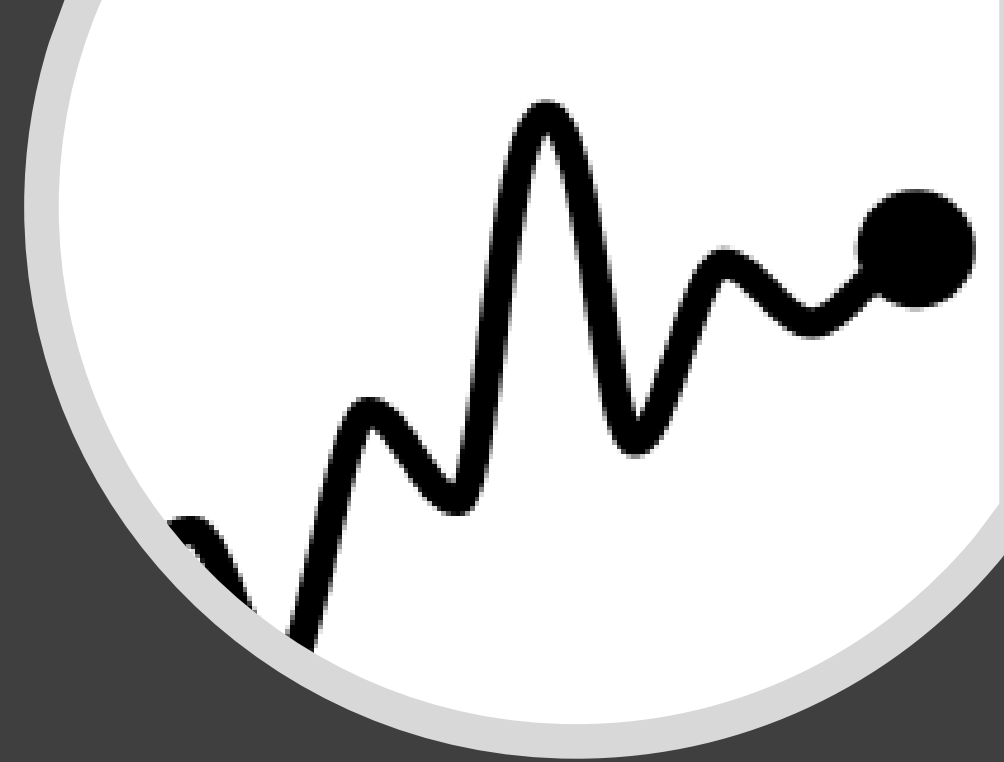
Digitization Lab

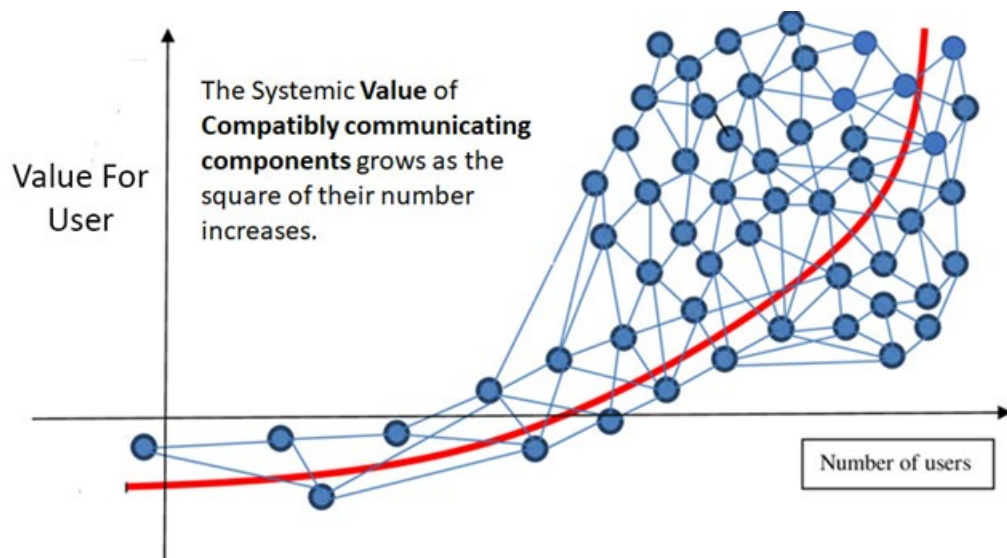
## **Year 4**

ETD Middleware (VIREO) and OJS Software

## **Year 5**

Complex Digitization Projects, IIF Server, Faculty Grant Projects etc.





Questions, Comments and Funders and Foundations with global vision and a passion for solving one of the 21<sup>st</sup> Centuries Grand Challenges for Global Research



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<http://rayuzwyshyn.net>