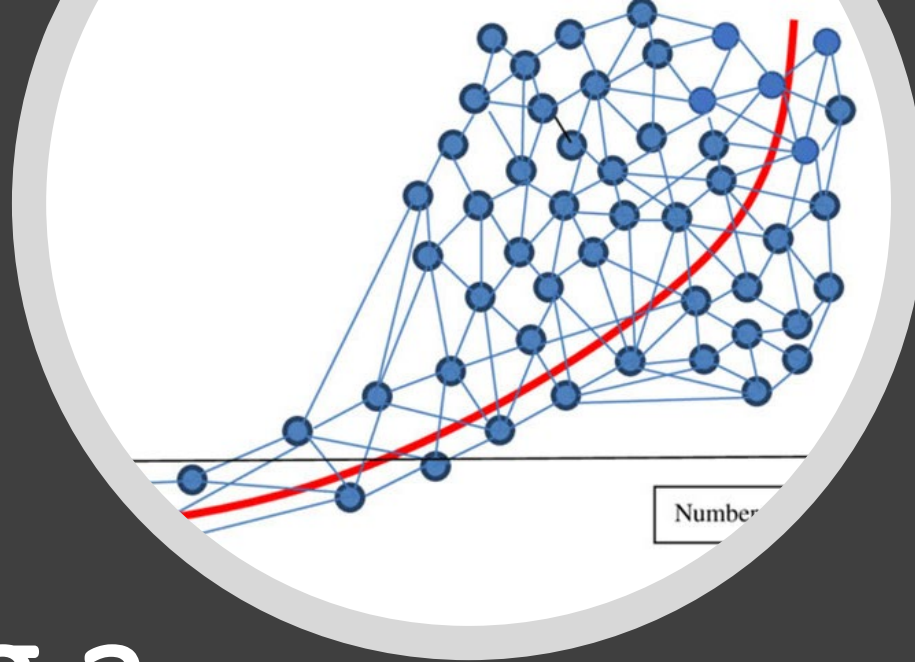


Developing a Digital Scholarship Research Ecosystem



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<http://rayuzwyshyn.net>, R_U@txstate.edu
Director, Collections and Digital Services
Texas State University Libraries

Presented for ICEIT2020
St. Anne's College, Oxford University
Oxford, United Kingdom
February 12, 2020



Repository



Identity Management System

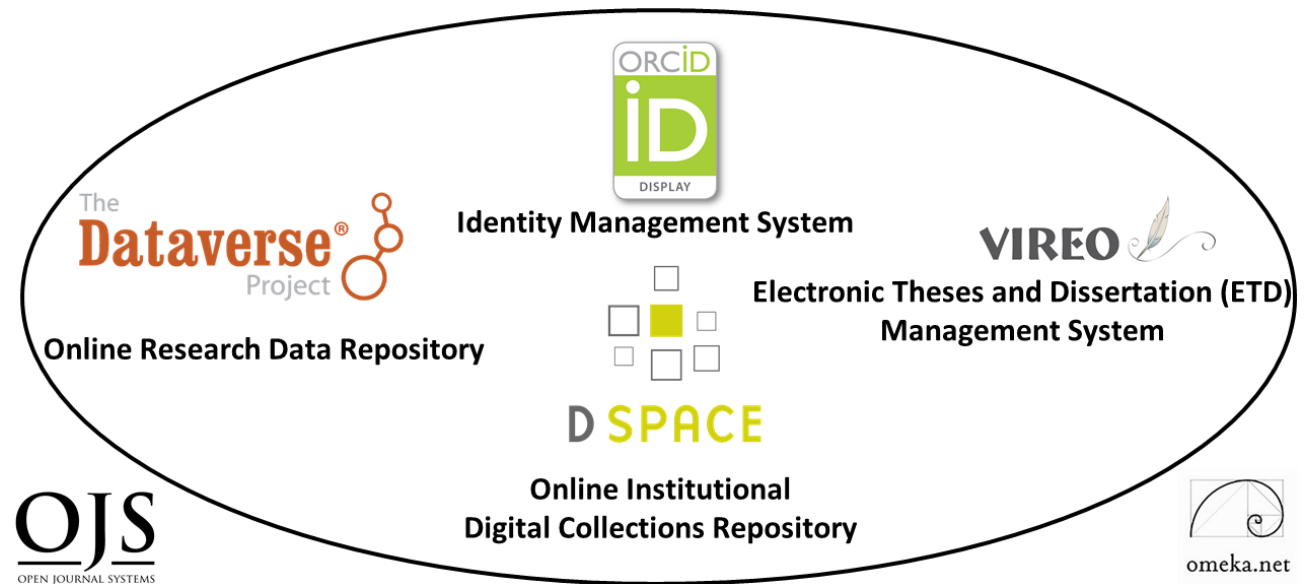


Elect

DSpace

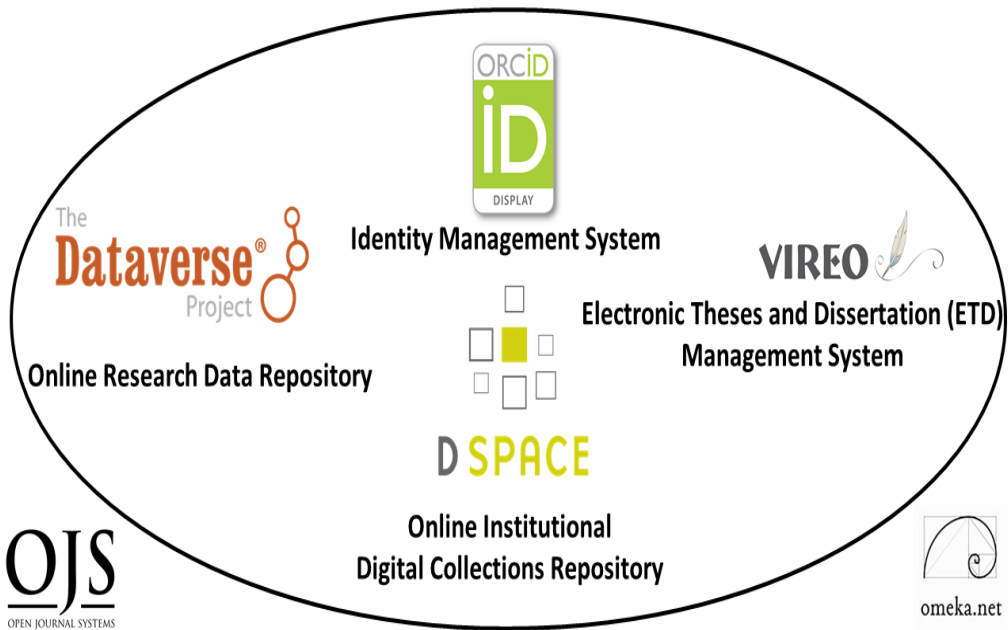
Online Institutional
Digital Collections Repository

What is a Digital Scholarly Research Ecosystem?

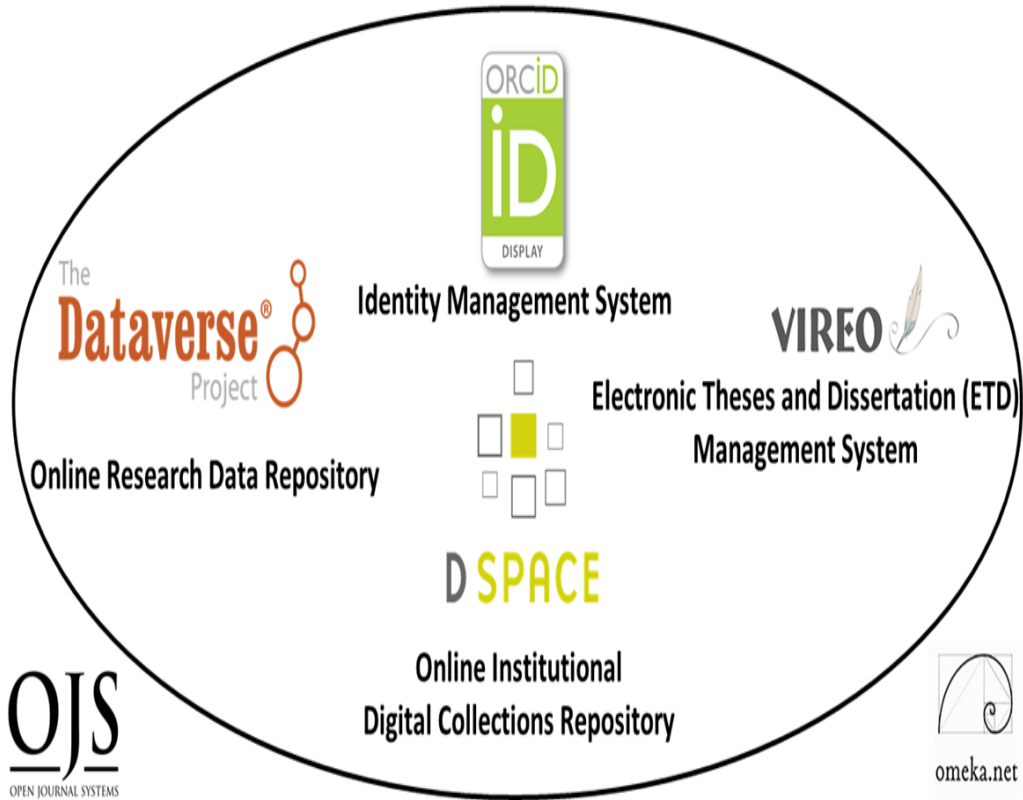


Network of Several Software Components to Enable Faculty and Student Research
and Raise Research Profiles

General Characteristics of This Digital Scholarly Research Ecosystem



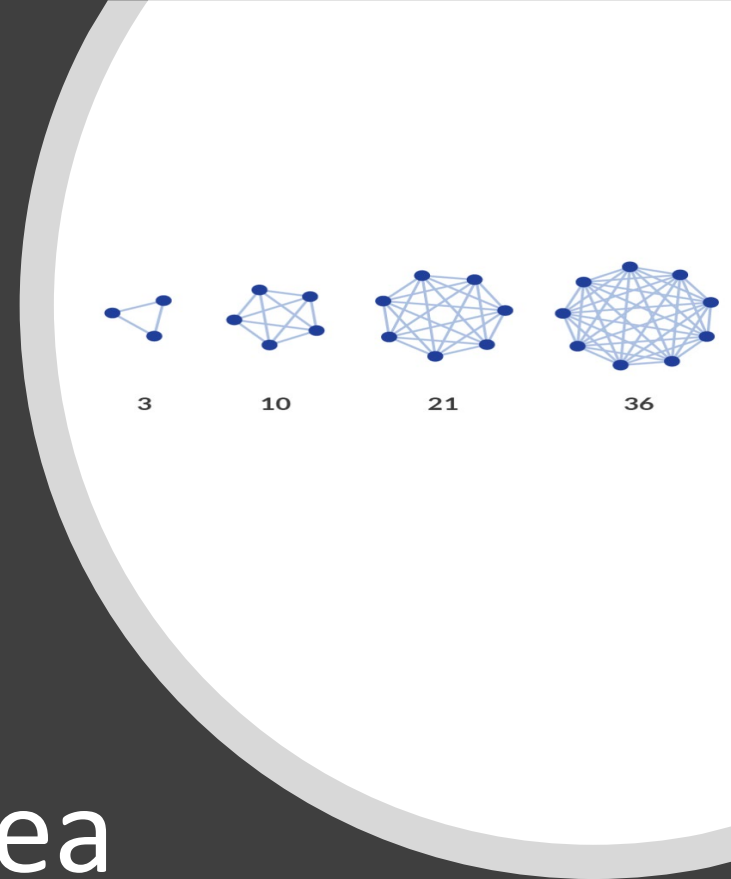
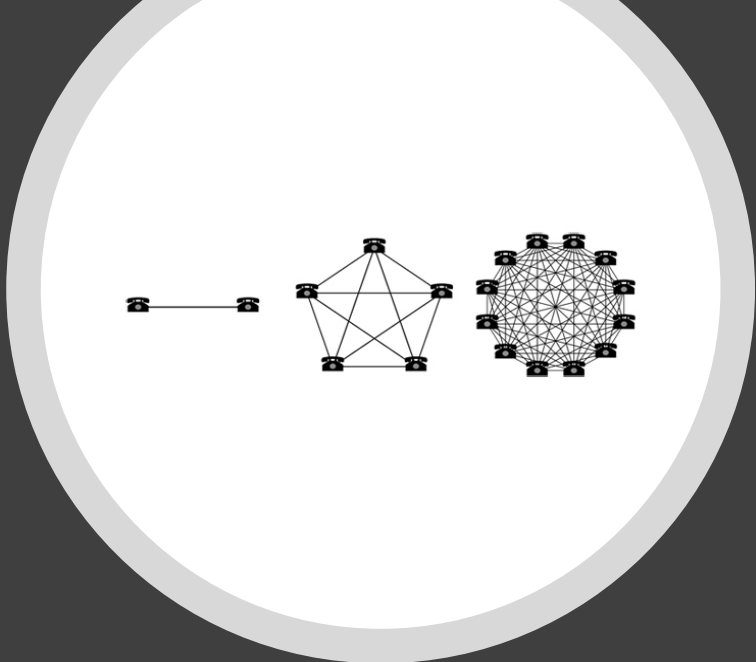
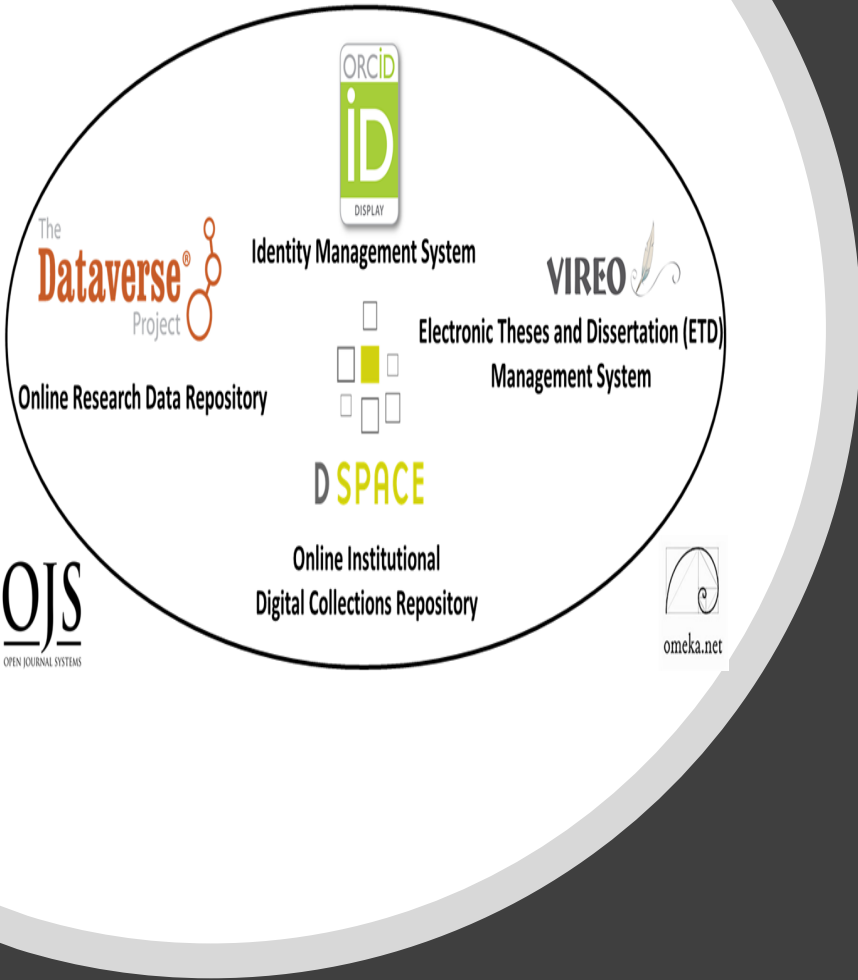
- Open Source Software
- Customizable Components
- Active Developer Communities



Digital Ecosystem Consists of Six Main Software Components

- Digital Collections Repository (Dspace)
- Research Data Repository (Dataverse)
- Identity Management System (ORCID)
- ETD Management System (VIREO)
- User Interface Software (OMEKA)
- Open Journal Software (OJS3)

Hardware: Digitization Lab

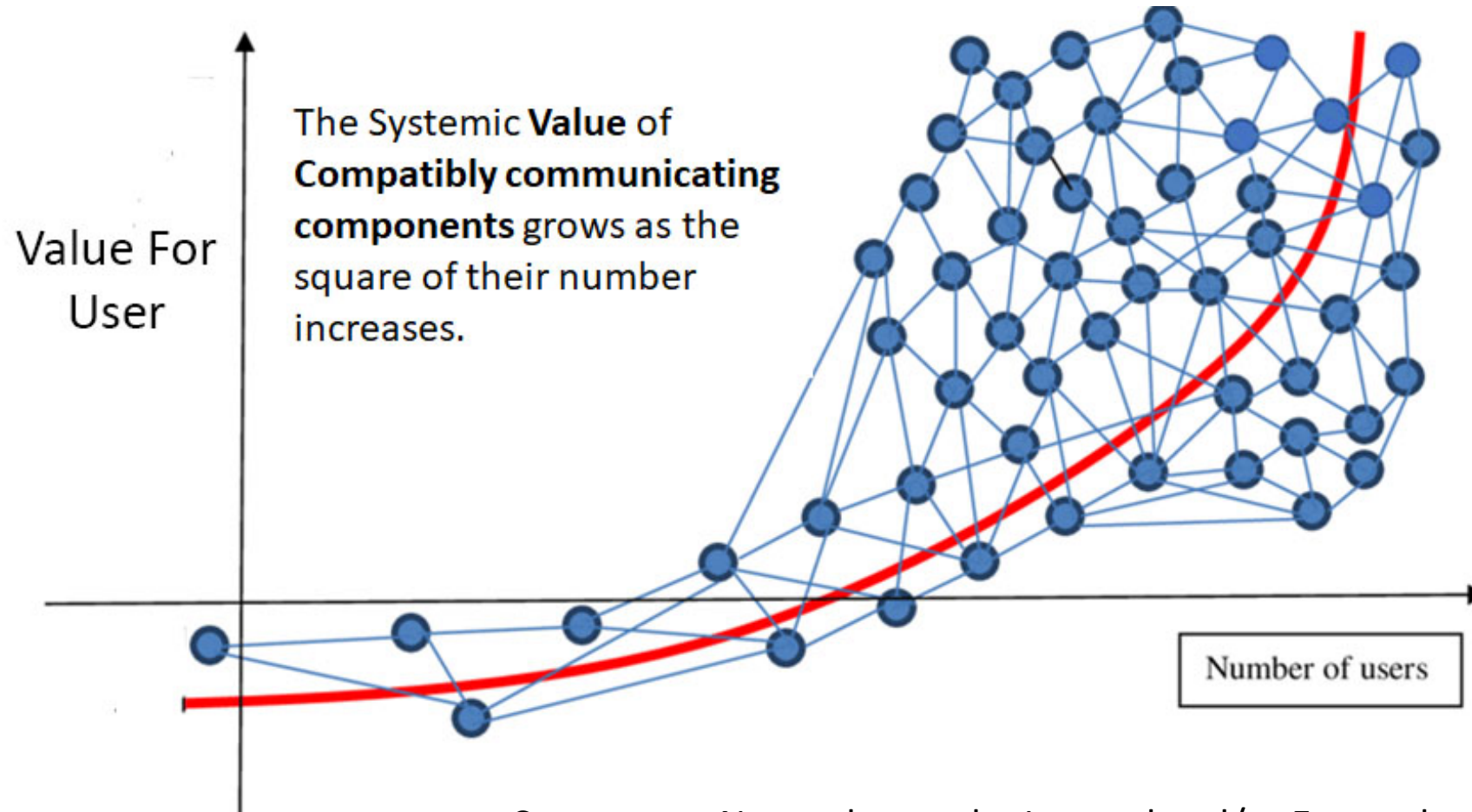


Simple Larger Idea

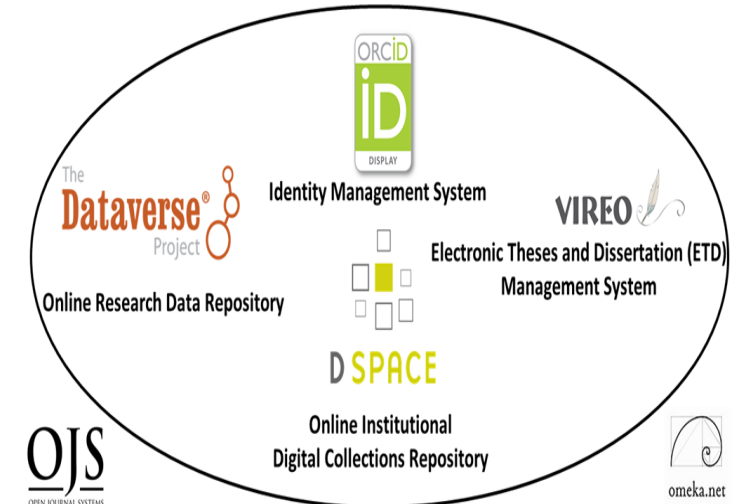
Collocating Open Source Digital Components in a Networked Research Ecosystem Enables Larger Connections and/or Network Effects

Ecosystem Metaphor Looks at Component Relationships

Network Effects: Metcalfe's Law



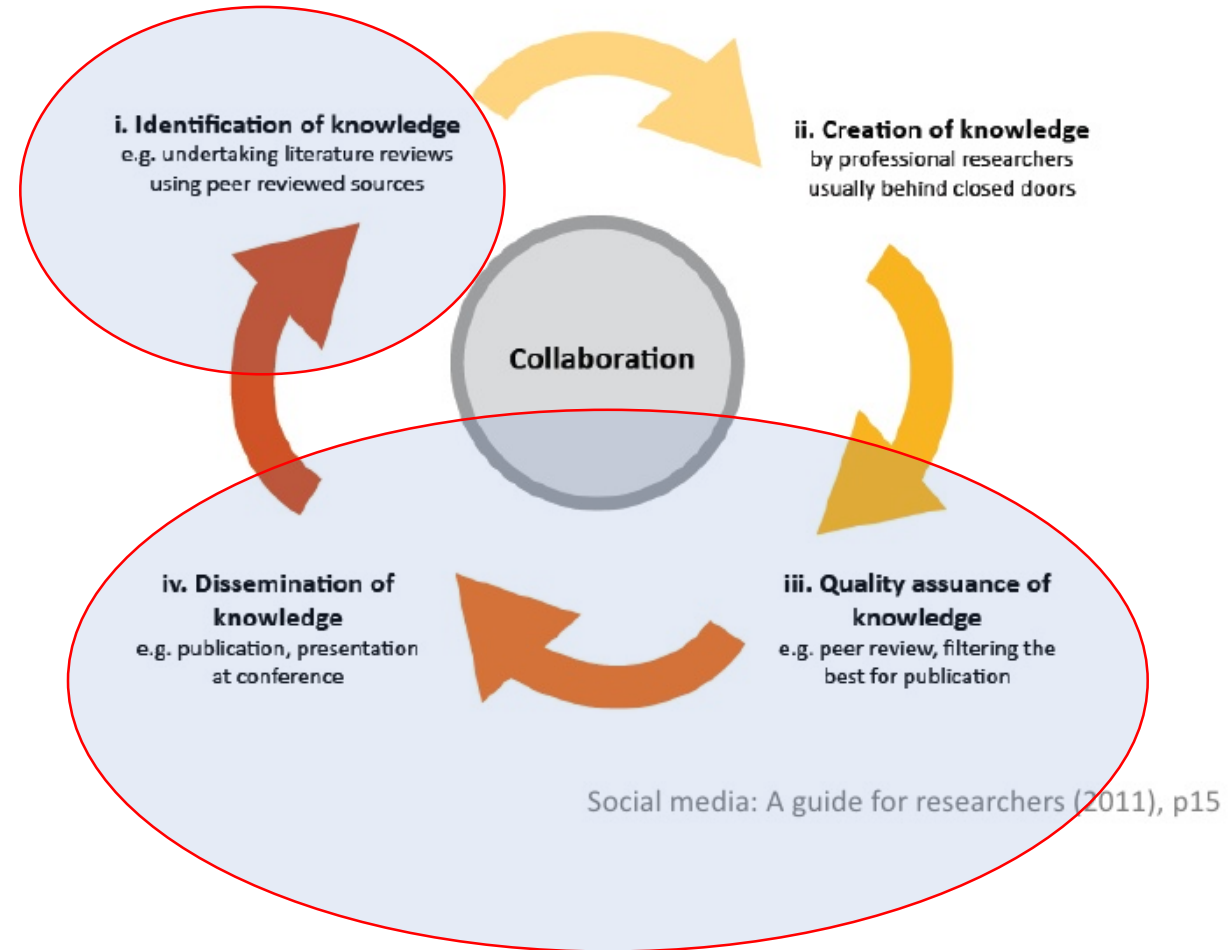
Component Networks may be Internal and/or External



Together, These Digital Ecosystem Components Enable Various Parts of the Academic Research Cycle



The academic research cycle



Texas State University
Libraries
Digital Scholarly
Research Ecosystem
Primary Components





Institutional Digital Collections Repository (Dspace)

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

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

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.

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dc.contributor.author	Felix, C. L.
txstate.contributor.author	Donnelly, David W., Southwest Texas State University, Dept. of Physics
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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
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Download

Name: Donnelly-2001 APL ...
Size: 322.5Kb
Format: PDF

This item appears in the following Collection(s)
• Faculty Publications-Physics

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)

Application of Structured Metadata Schema for Search Engine Optimization Leads to Accessibility and Multiple Points of Access

The image is a screenshot of a Google search results page. The search bar at the top contains the text "athermal annealing of low-energy boron", which is circled in red. Below the search bar, the navigation tabs "Web", "Shopping", "Images", "Videos", "News", "More", and "Search tools" are visible. The "Web" tab is selected and highlighted with a red underline. Below the tabs, a blue box indicates "About 105,000 results (0.36 seconds)", also circled in red. The search results are listed below. The first result is "Scholarly articles for athermal annealing of low-energy boron", followed by three snippets: "Athermal annealing at room temperature and ... - Shao - Cited by 19", "Athermal annealing of low-energy boron implants in ... - Donnelly - Cited by 10", and "Hydrogen passivation of silicon carbide by low-energy ... - Achtziger - Cited by 53". The second result is "Athermal annealing of low-energy boron implants ... - Scita...", with a snippet from "scitation.aip.org/content/.../1.1359784?..." and "American Institute of Physics". The third result is "Athermal annealing of low-energy boron implants in silicon", with a snippet from "digital.library.txstate.edu" and "Faculty Publications-Physics", which is circled in red. The fourth result is "Athermal annealing at room temperature and enhanced ...", with a snippet from "connection.ebscohost.com/.../athermal-annealing-room-temperature-enh...".

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

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by DW Donnelly - 2001 - Cited by 10 - Related articles

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Athermal annealing of low-energy boron implants in silicon

digital.library.txstate.edu > ... > Faculty Publications-Physics

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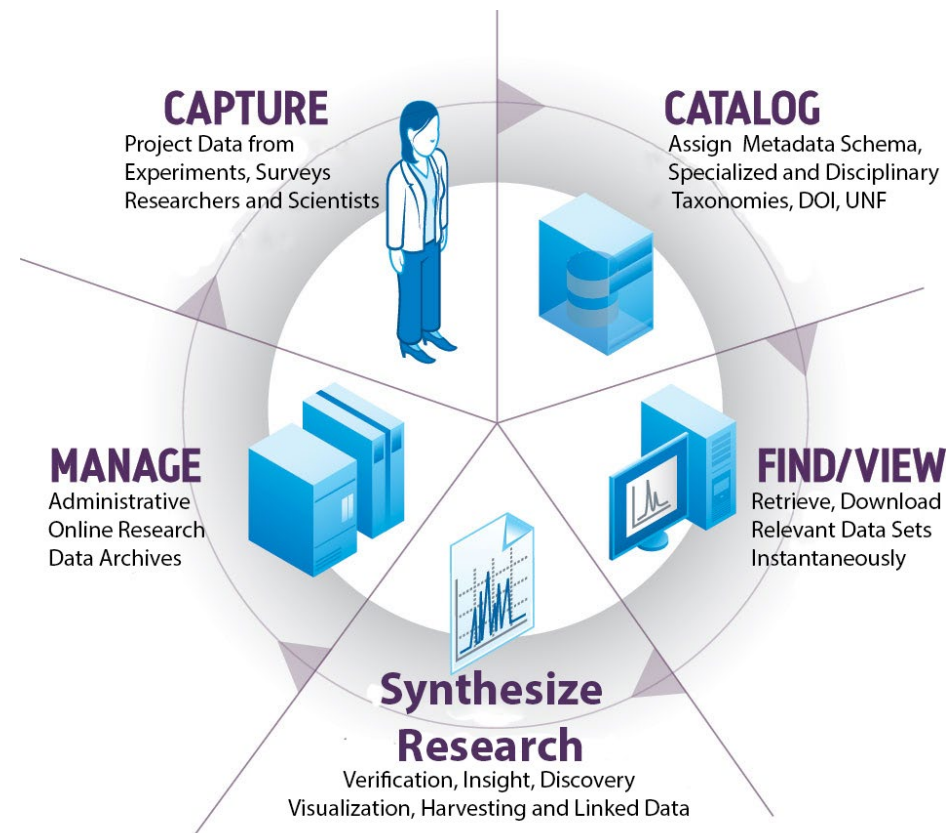
Athermal annealing of implantation damage induced by low energy boron implants at room temperature was observed after coimplantation and such annealing ...

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Immediately
Available

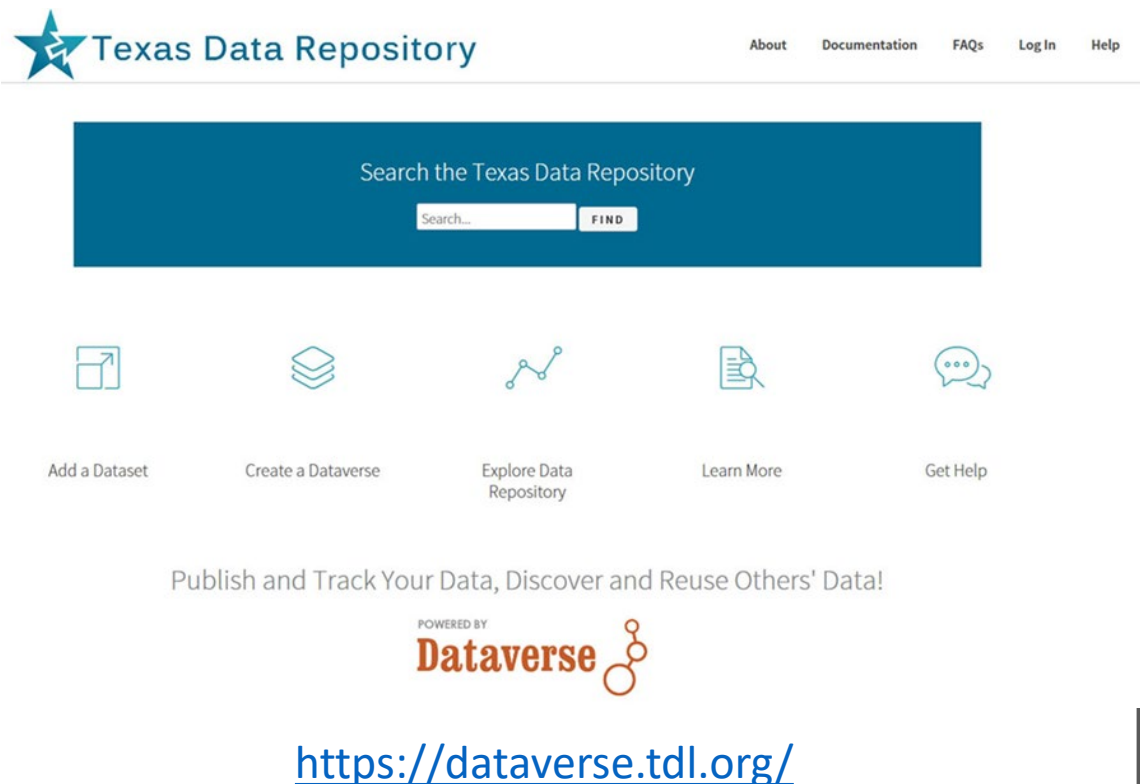
Research Data Repository



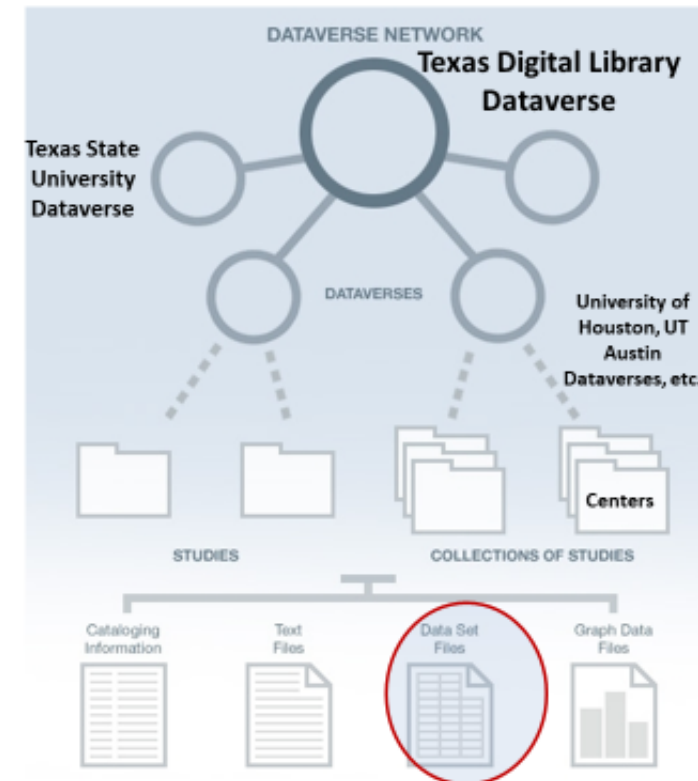
<https://dataverse.tdl.org/dataverse/txstate>



The Dataverse can be configured as a single Instance or as a Consortial Model



Dataverse Architecture (Consortial)



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

Digital Scholarly Research Ecosystem

Secondary Components
(Dependent on Primary Digital
Repositories for Content and Data)

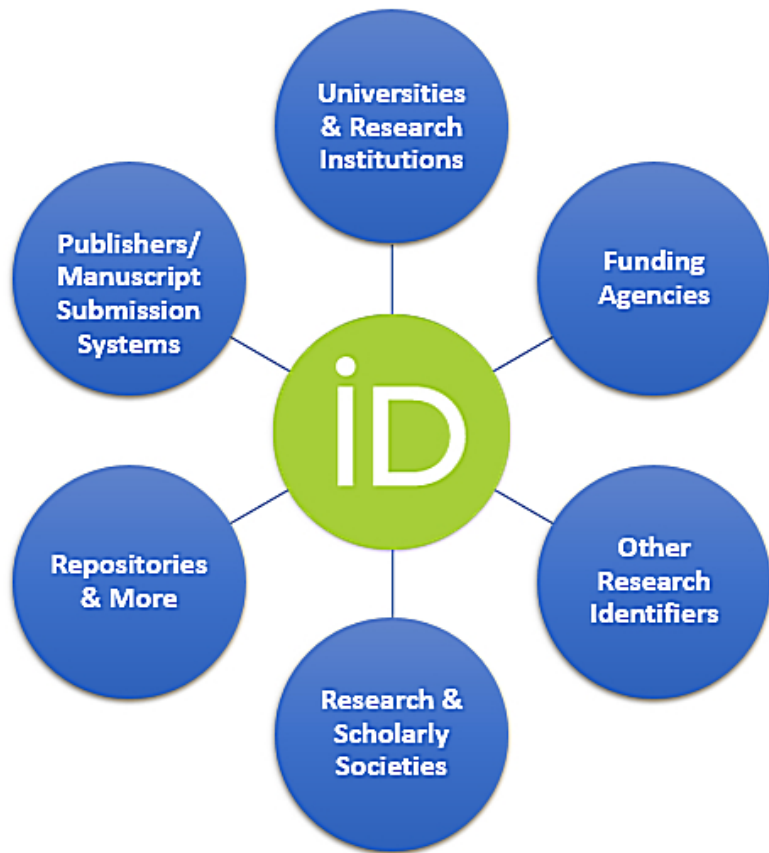


Vireo



Electronic Thesis and Dissertation Management System

- Addresses Intermediary steps in the ETD Process
- Connects with Both the Collections Repository And Data Repository so students can publish and link their theses dissertations and data
- Bridges Student Thesis/Dissertation Submission with Graduate School Review, Online Publication and ETD Preservation



ORCID is a hub connecting the research landscape

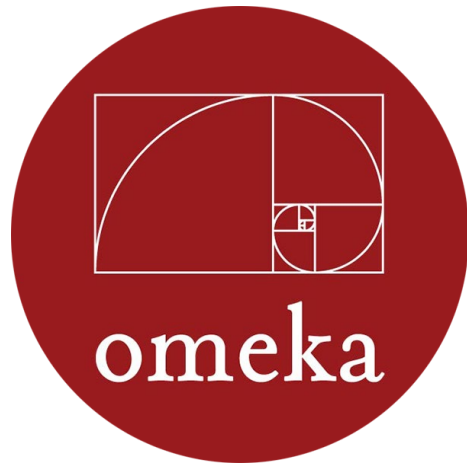


Researcher Identity Management System

- Gives Researchers Unique Number (ORCID ID) Connecting and Disambiguate Scholars names
Maria Hernandez, Biochemist
Maria Hernandez, M.D. or Astrophysicist
- Allows publications from a researcher to be found, linked and aggregated across multiple information Systems.
- Allows Papers in the collections repository and datasets in data repository can 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 OJS



Open Source User Interface Software

Allows an elegant portal/gateway entrance for larger scholarly research projects, digital collections and data repositories - linking text, image media and datasets and acting as a front end for connecting components and component networks.



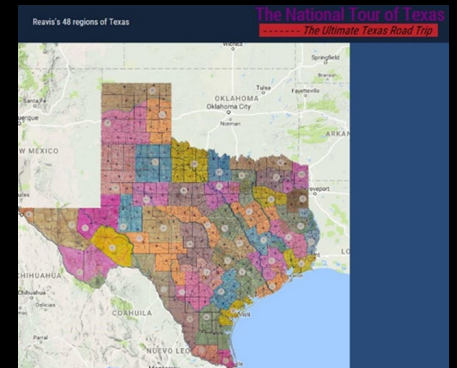
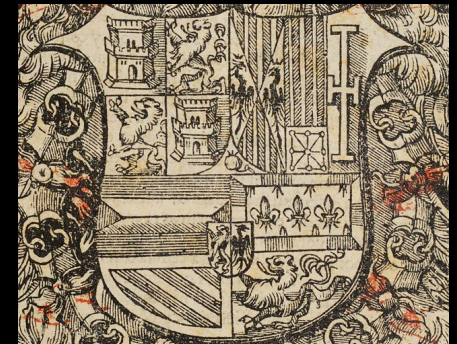
Open Access Academic Journal Software for refereed journal online publishing, workflow and connections with background research and datasets etc. through Dataverse/Dspace connections

The Digitization Lab



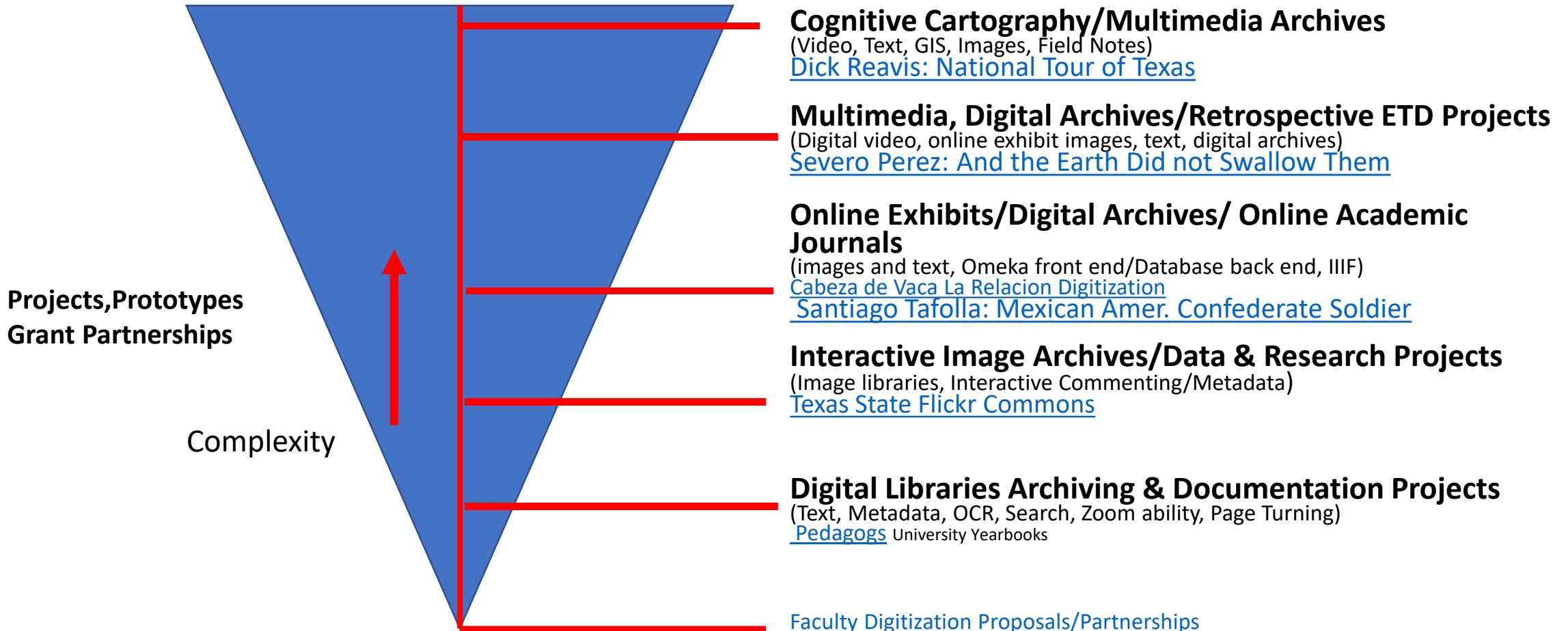
- Expands Possibilities for Faculty Research Projects
- Possibilities range from OCR, image, book, manuscript & journal digitization to 3D objects, audiovisual material, GIS and visualization technologies (IIIF etc)

(i.e. Digitization Lab's IIIF Framework can create internal or globally distributed Image Libraries.



Combining Research Ecosystem Components

Opens Amazing Possibilities For Digital Scholarship & Collaboration Opportunities



Human Resources and Implementation Paths

- **System Administrator/Programmer**
server infrastructure set-up/maintenance/basic customization
- **Digital Collections Librarian/Specialist**
Software Administration, Marketing, User Support

(Further Expansion Possibilities: Web Developer, Programmer Project Manager, Metadata Librarian, Digitization Specialist, GIS Specialist, Data Visualization Specialist, AI Specialist/Post-Doc)

Timelines, 1-5 Years (Many Roads to Rome)

Year 1 : Digital Collection Repository and Digitization Lab

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

Year 3: Data Repository

Year 4: ETD Middleware (VIREO) and OJS Software

Year 5 Complex Digitization Projects, IIF Server, Faculty Grant Projects etc.



Ecosystem Assessment and Results

Quantitative and Qualitative Measures

Annual Usage Growth
(Downloads, Number of
Items, ORCID ID's
and Hosted Journals)

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 Added					
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

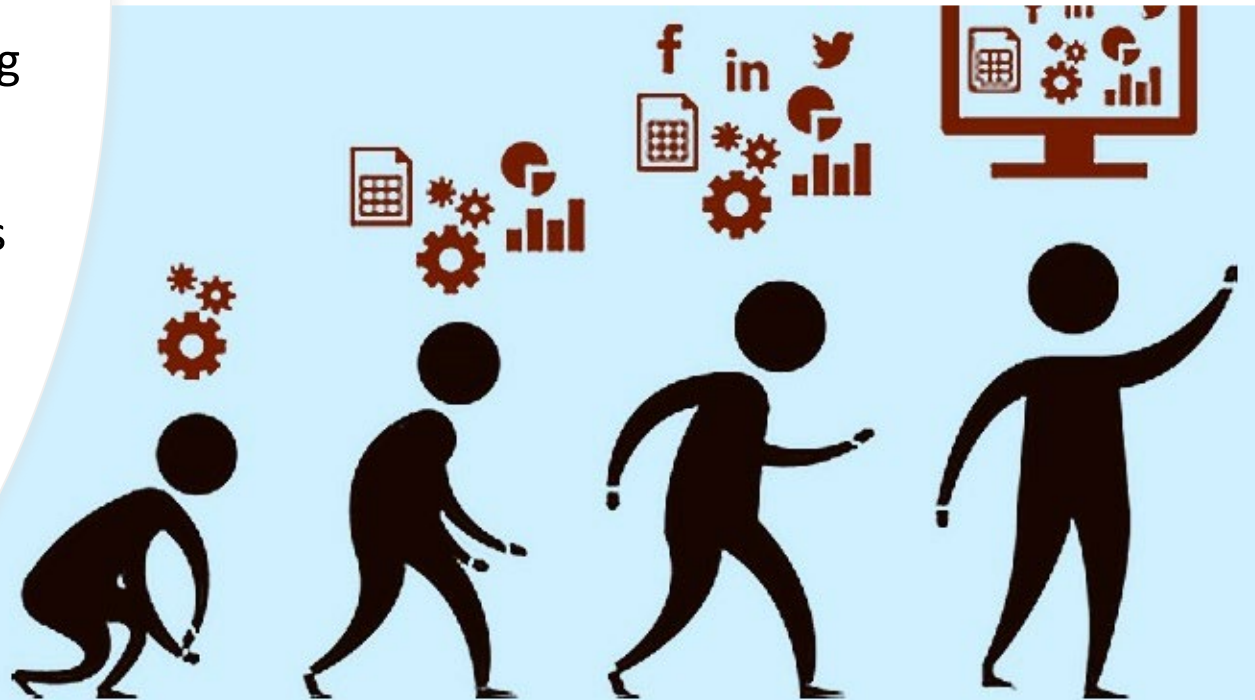
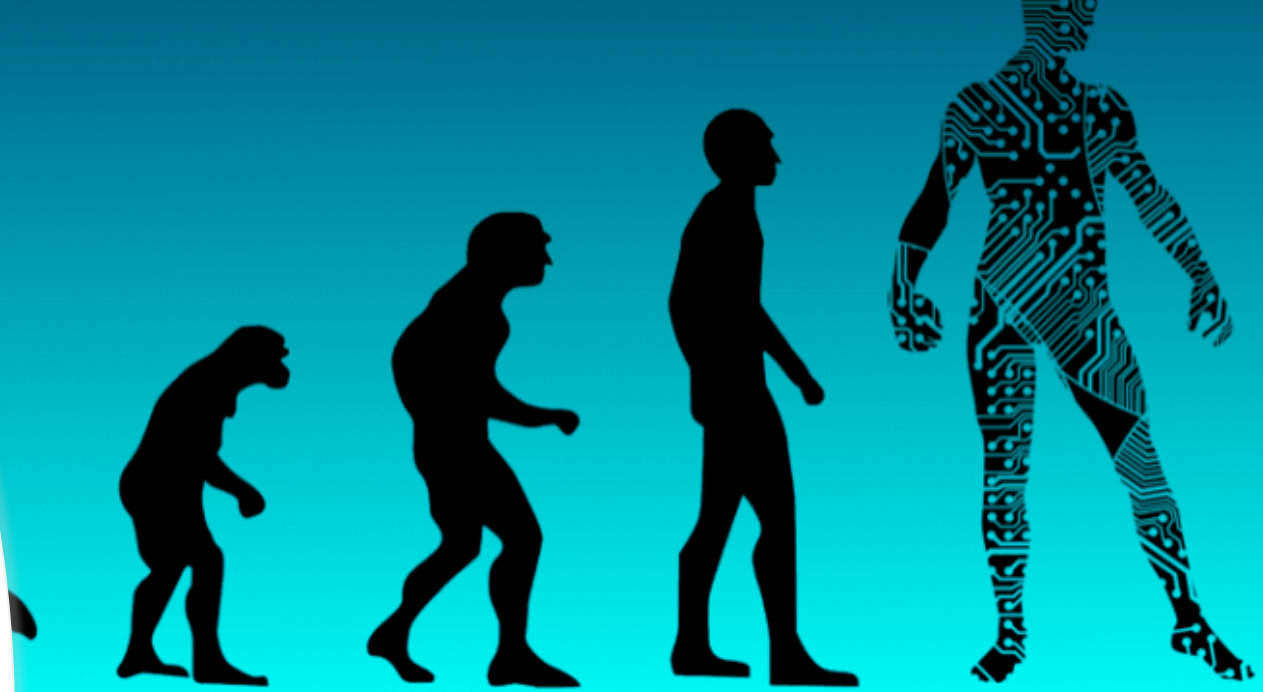
LibQual Biannual Survey
2013-2019, Faculty and
Student System Perceptions,
Comments

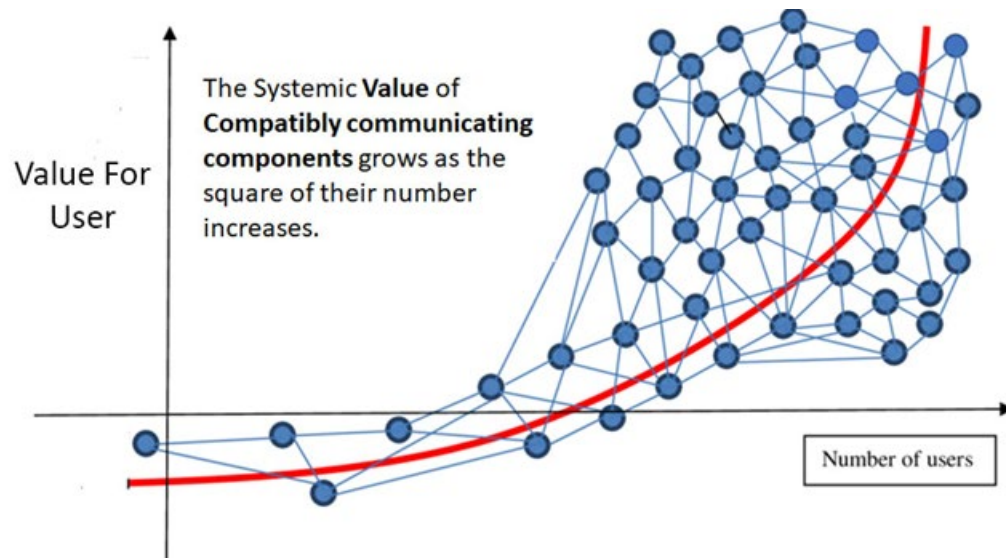


Summary Reflections

Placing Digital Scholarship Components within an Ecosystem Paradigm Enables:

- 1) Better Guidelines and Roadmaps for Developing Digital Scholarly Components
- 2) Pathways Forward and Evolutionary Possibilities for Future System Development
- 3) New Possibilities For Researchers within the academic research cycle





Questions, Comments

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Director, Collections and Digital Services

Texas State University Libraries

ruzwyshyn@txstate.edu, 512-245-5687

<http://rayuzwyshyn.net>

Further References

Uzwysyn, R. 2020 **Developing an Open Source Digital Scholarship Ecosystem (Preprint)**. ICEIT2020. Oxford, UK.
https://www.researchgate.net/publication/336923249_Developing_an_Open_Source_Digital_Scholarship_Ecosystem

Texas State University Libraries Website.

<https://www.library.txstate.edu/>

Texas State Digital Collections Repository

<https://digital.library.txstate.edu/>

Texas State Data Research Repository

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

Texas State Online Research Identity Management System:

<https://guides.library.txstate.edu/researcherprofile/orcidTexas>

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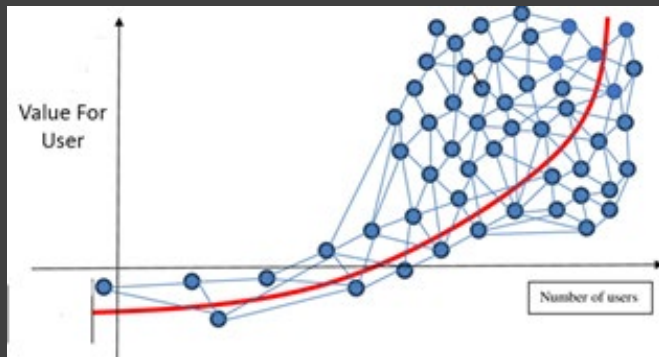
<https://www.tdl.org/etds/>

Texas State Digital & Web Services:

<https://www.library.txstate.edu/services/faculty-staff/digital-web-services.html>

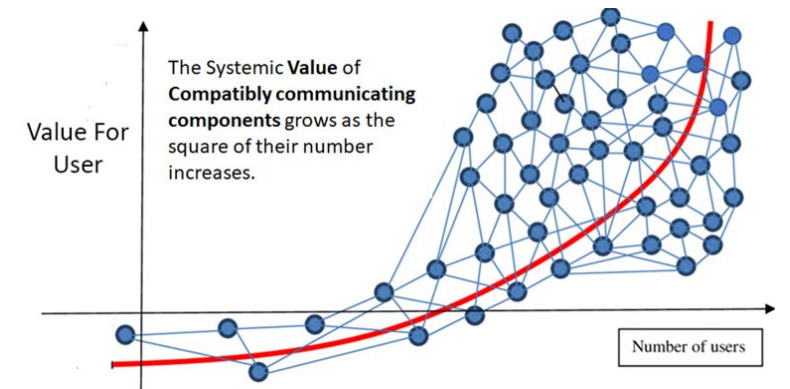
Future Pathways

Networked Global Scholarly Research Environment



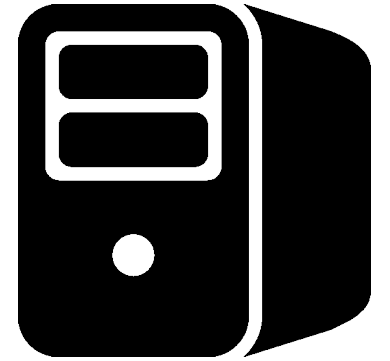
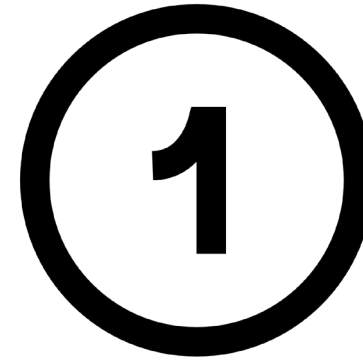
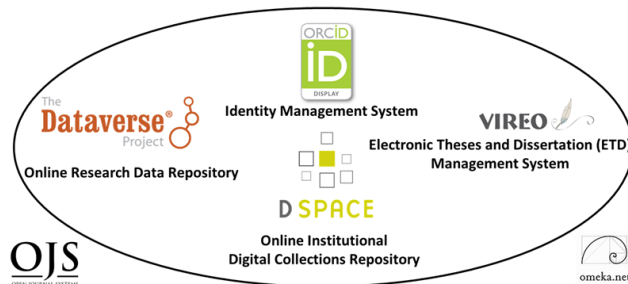
Research Universities and Digital Research Ecosystems

- **~266-300 Research Institutions US & Canada**
Carnegie R1 & R2, Very High or High Research Activity
- **~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.
- **Enable Top 2-3% Research Institutions Globally, 1000 Institutions beyond the US and Canada.**
(This represents the other 90% of Research Libraries Globally)

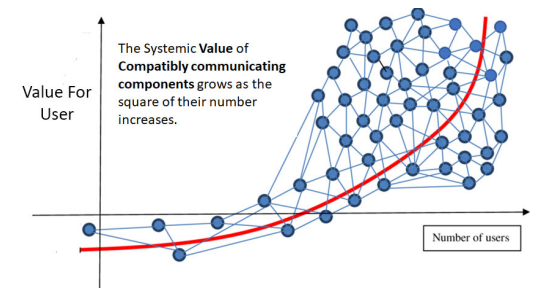
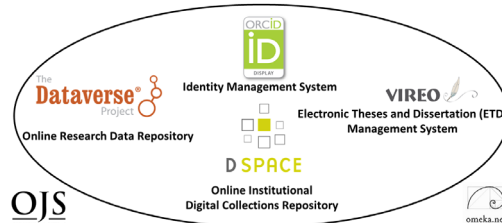
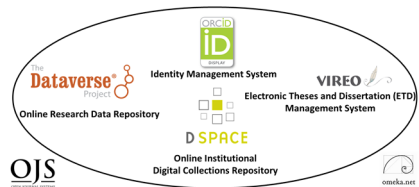
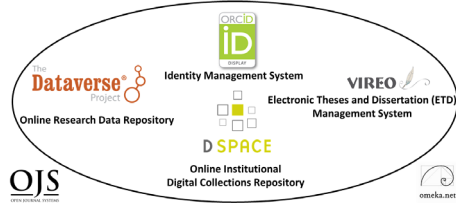


One Server Per Research Institution 2020-2025

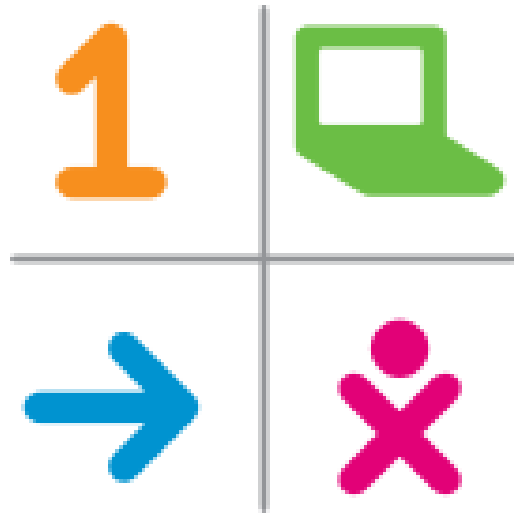
- Empower 1000 Research University Institutions/Research Libraries Globally
- Gift each Research University One Configured Server Ecosystem with 6 Open Source Scholarly Research Software Components, < \$1000.00 US/Server or set up Fractional Server Space with Mirror Sites Globally (SAAS)
- Set Up brief weeklong training over five continents
- Connect Networks
- **Measure the Effects**



Can we Enable Scholarly Research Network Ecosystem Possibilities on Global Levels?



Is it Desirable or Time to Begin Thinking About Empowering a Global Research University Community ?



one laptop per child



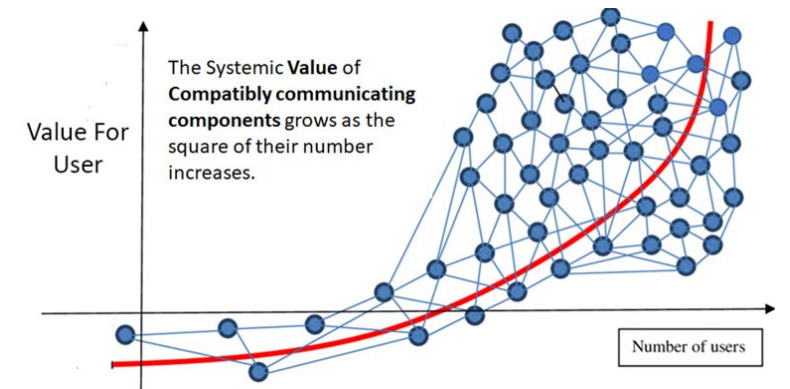
Brainstorming Models One Laptop Per Child

Dreamed up mid-late 90's, Launched 2005

- Nicholas Negroponte, MIT Media Lab Founding Director
- Noble Initiative/Grand Ambitions
- Vision: Give each child in world access to a laptop with open source software for less than 100.00 \$US/laptop
- Gage Effects For Education Globally
- Can We do the same thing for academic research globally?

Research Universities and Digital Research Ecosystems

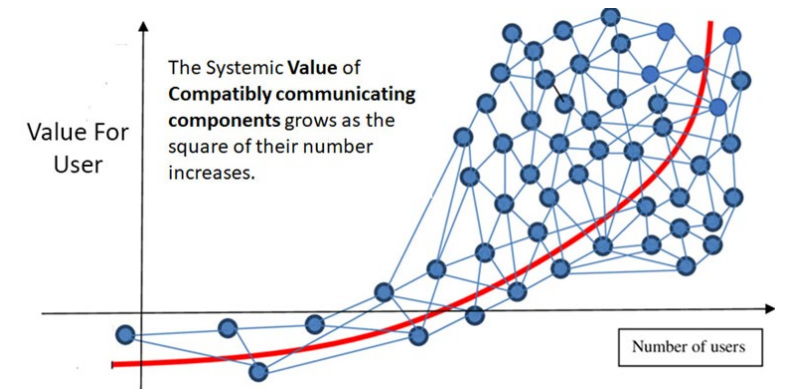
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- **~1000-1250** Research Universities Worldwide
QS Rankings and Times Higher Education Supplement. (40% Europe, 26.5% Asia Pacific, US/Canada 18%, Latin America 9% and Middle East/Africa.
- **26,000-40,000** Universities Globally. Research Universities 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



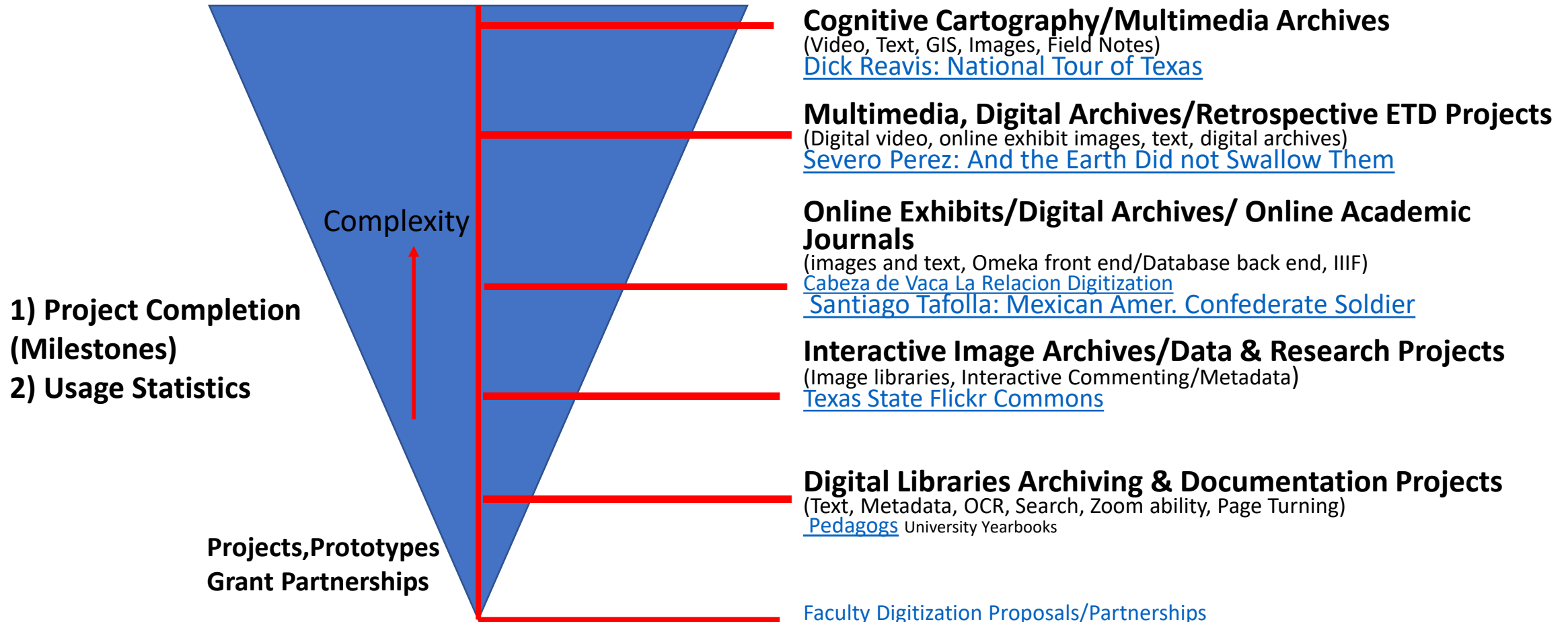
Research Universities and Digital Research Ecosystems

- **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



Larger Digital Scholarly Research Projects Can Act as Qualitative/Quantitative Benchmarks



Combining Components System Synergies

Digital Scholarly Research Ecosystem



OJS
OPEN JOURNAL SYSTEMS

The
Dataverse[®]
Project
Online Research Data Repository

ORCID
iD
DISPLAY
Identity Management System



DSPACE
Online Institutional
Digital Collections Repository

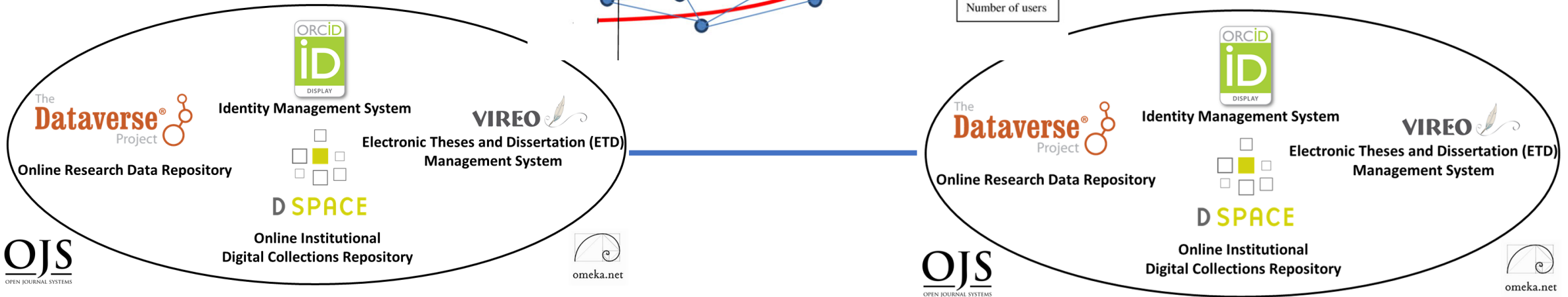
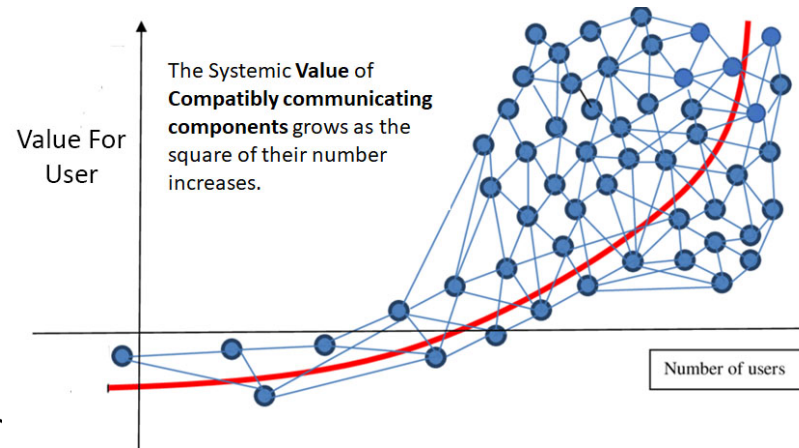
VIREO
Electronic Theses and Dissertation (ETD)
Management System


omeka.net



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)

Assessment and Results

Quantitative and Qualitative Measures

Ecosystem
Implemented
in Stages,
2014-2019

System	2014	2015	2016	2017	2018	2019
Downloads						
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
Number of Items						
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
ORCID IDs						
ORCID	101	190	316	438	545	669
Hosted Journals						
OJS	1	1	2	2	3	4

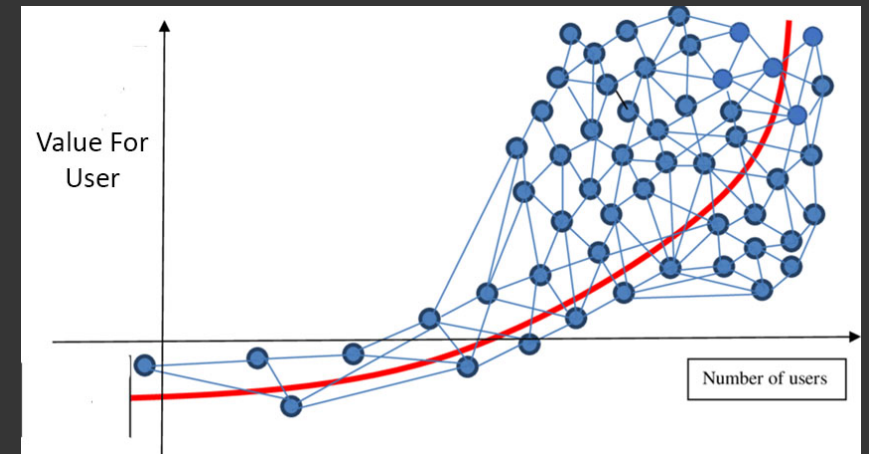
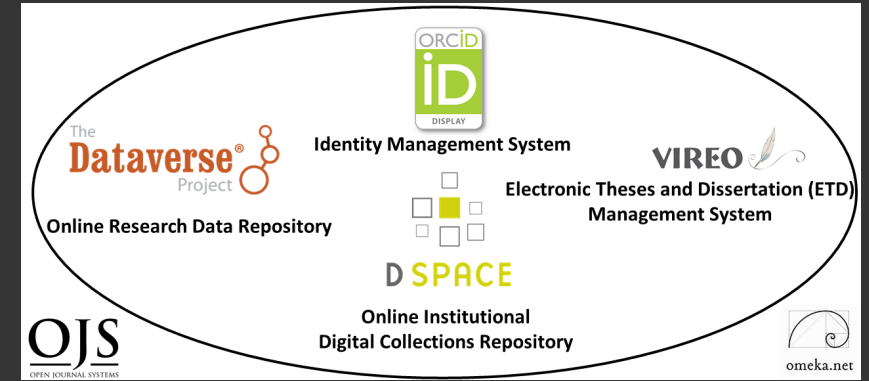
Annual Usage Growth
(Downloads, Number of
Items, ORCID ID's
and Hosted Journals)



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

Ecosystem as System Enables Core Research

- Articles, Theses, Dissertations in the collections repository can be associated with datasets in the data repository for reference, verification or reproducibility.
- Journal article citation lists can be associated with articles and datasets in the Collections and Data Repositories
- Further Desired Connections can also guide developmental paths for both component software and the ecosystem



Digital Collection Repositories Gives Insight and another window into Faculty/Student Research (Statistics)



BROWSE

All of Digital Collections

Communities & Collections

ACCOUNT

Login

STATISTICS

Most Popular Items

Statistics by Country

Most Popular Authors

Most Popular Items

10 results

Entire repository

All regions

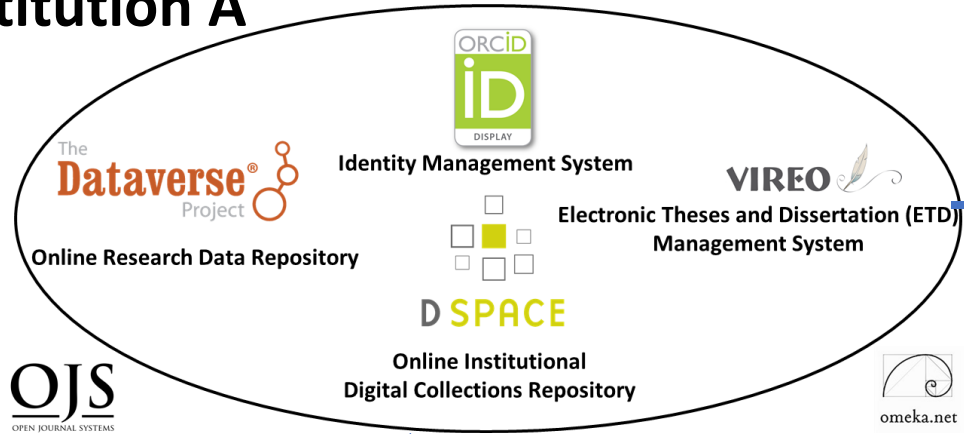
All time

Item title	File downloads	Item views	Sum
Fear: A Psychophysiological Study of Horror Film Viewing	70,564	8,161	78,725
Study of Museum Lighting and Design	67,844	2,082	69,926
Female Figurines of the Upper Paleolithic	62,848	2,103	64,951
Gender Differences in Parenting Styles and Effects on the Parent-Child Relationship	61,284	3,392	64,676
A Study of the Relationship Between Absenteeism and Job Satisfaction, Certain Personal Characteristics, and Situational Factors for Employees in a Public Agency	52,937	4,005	56,942
"The Decoded Message of the Seven Seals," by David Koresh	48,721	23,917	72,638
Mobile Dating in the Digital Age: Computer-Mediated Communication and Relationship Building on Tinder	48,681	16,672	65,353
A Preliminary Analysis: Prison Models and Prison Management Models and the Texas Prison System	47,934	2,705	50,639
Bottled Water: Why Is It so Big? Causes for the Rapid Growth of Bottled Water Industries	39,859	783	40,642
Introduction to Image Processing with Python and Jupyter Notebooks	32,111	2,688	34,799

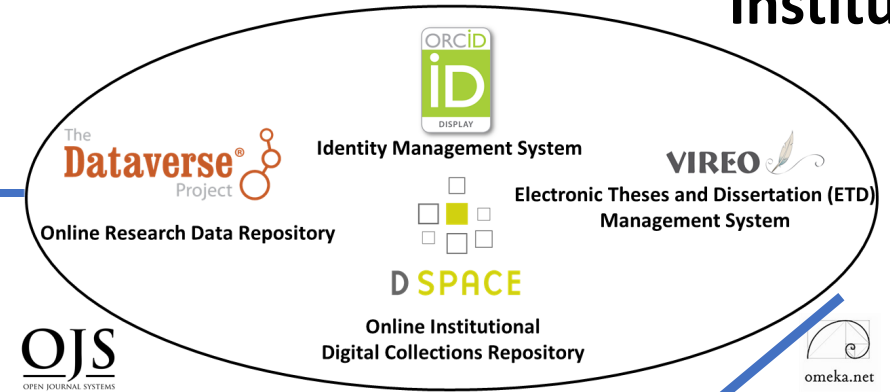
File downloads, total
6,980,613

Network Effects Allow Opportunities Among Research Institutions

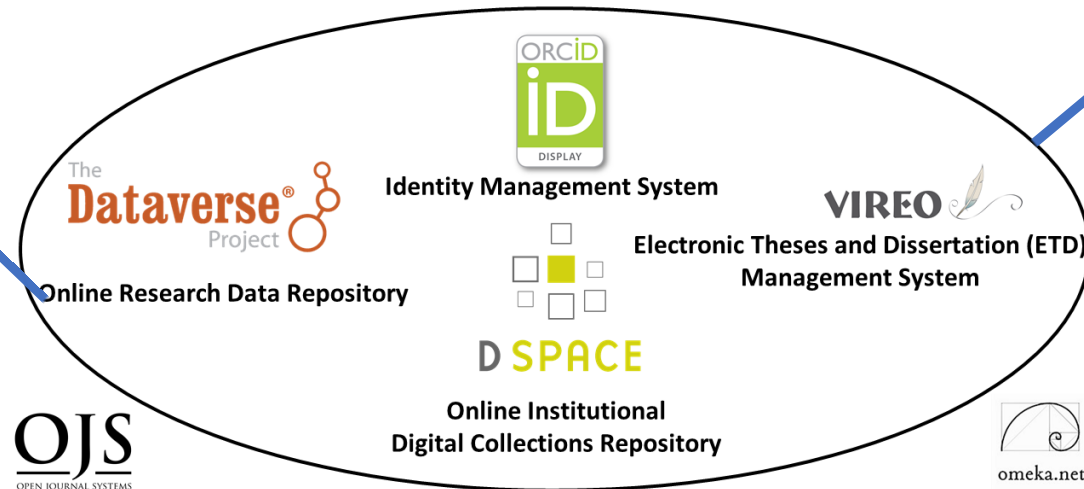
Research
Institution A



Research
Institution B



Research
Institution C



Digital Scholarly Ecosystem Timelines and Implementation Paths

Many Roads To Rome (1-5 Year Paths)

Year 1 : Digital Collection Repository and Digitization Lab

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

Year 3: Data Repository

Year 4: ETD Middleware (VIREO) and OJS Software

Year 5 Complex Digitization Projects, IIF Server, Faculty Grant Projects etc.

Ecosystem
Implemented
in Stages,
2014-2019

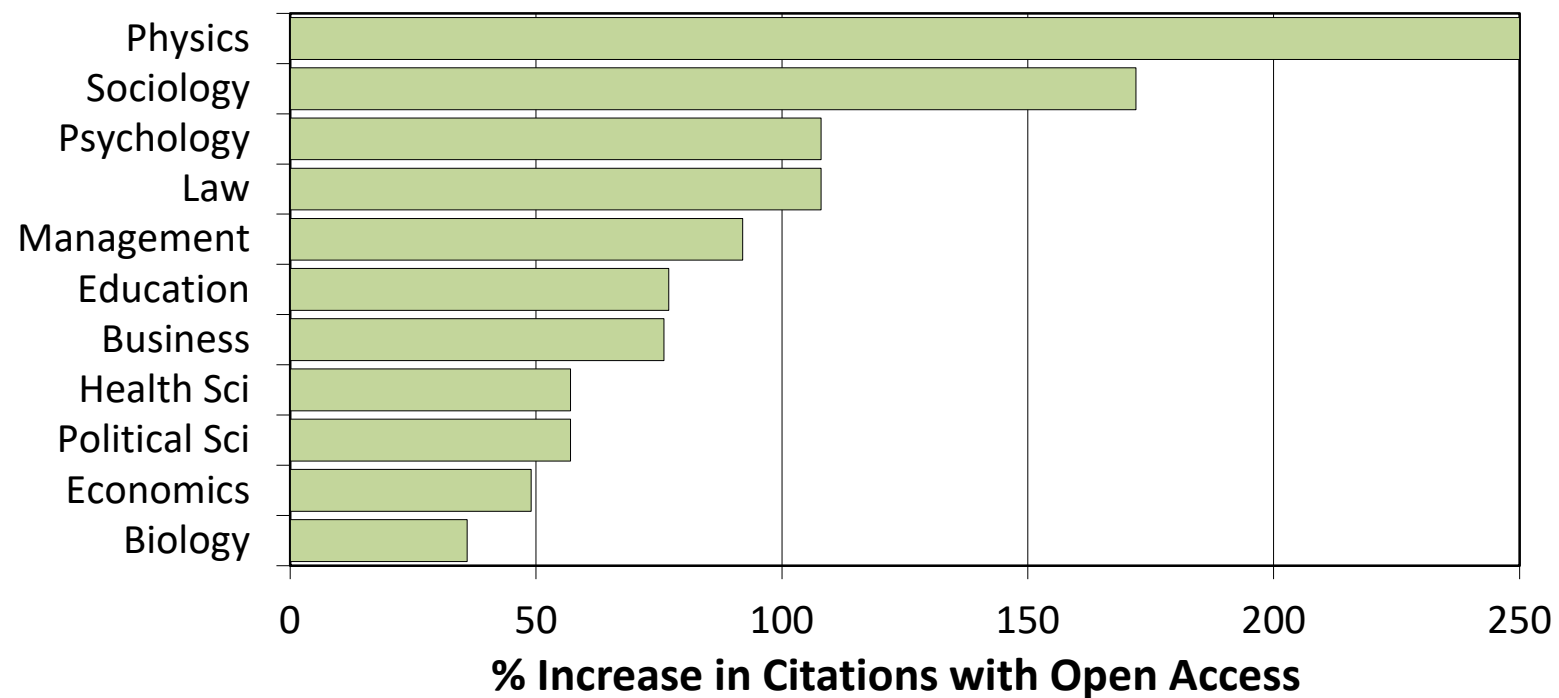


Human Resources

- **System Administrator/Programmer**
server infrastructure set-up/maintenance/basic customization
- **Digital Collections Librarian:**
Administration, Marketing, User Support, Collections and Data Repository, OJS/ORCID
- **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**



Percent Increase in Article Citations by Discipline with Open Access Online Availability (Immediately Available Through Google)



Range = 36%-250%

(Data: Stevan Harnad and Heather Joseph, 2014)

