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Data Management and Broader Impacts: A Holistic Approach

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Data Management and Broader Impacts: A Holistic Approach

Abstract

The National Science Foundation's (NSF) Broader Impacts Criterion asks scientists to frame their research beyond "science for science's sake." Examining data and data management through a Broader Impacts lens highlights the benefits of good data management, data management plans (DMPs), and strengthens the argument for better Data Information Literacy (DIL) in the sciences.

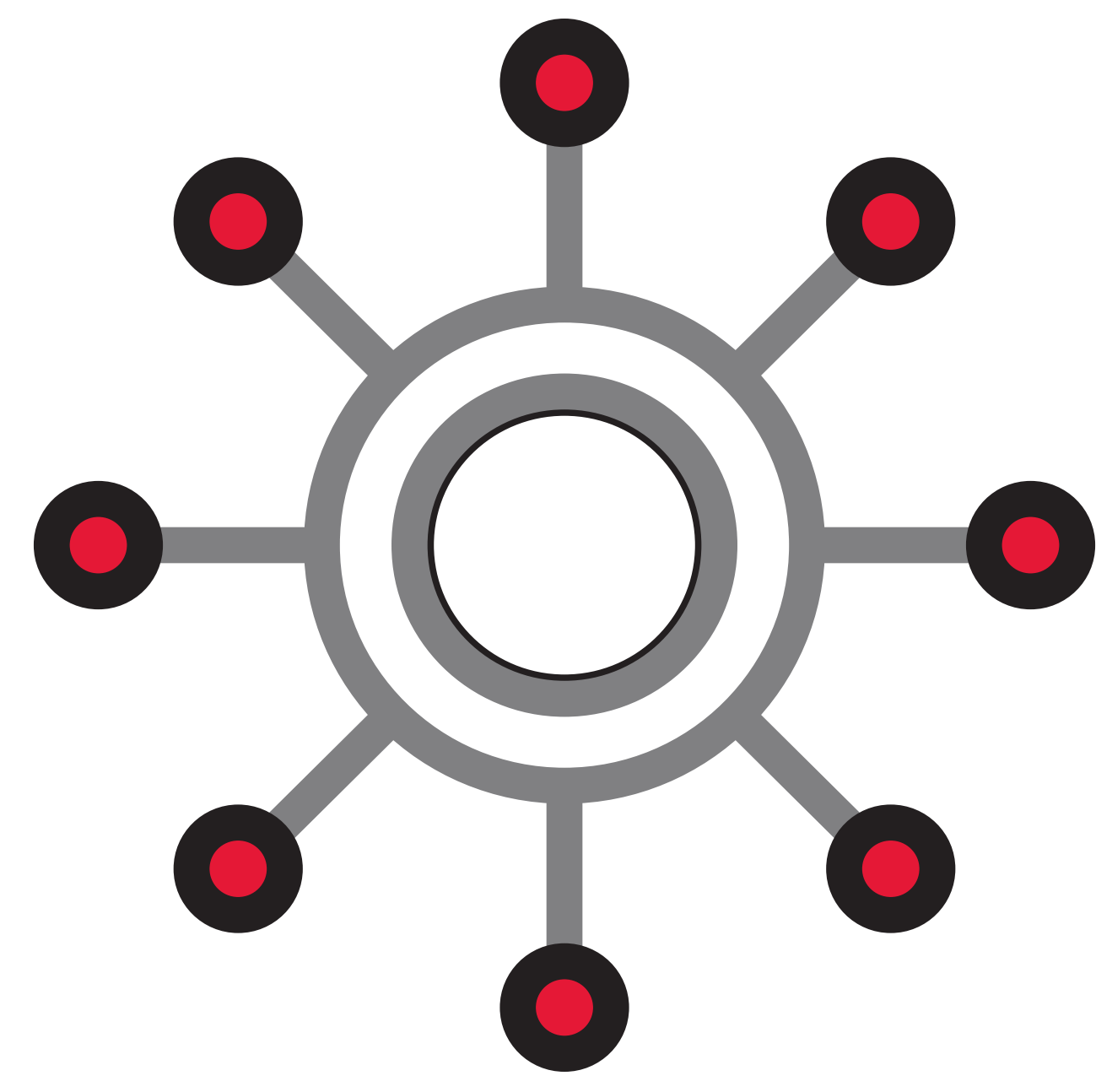
Keywords

Scholarly communication, research data, broader impacts, data information literacy

Disciplines

Library and Information Science | Scholarly Communication

Data Management and Broader Impacts: A Holistic Approach



Infrastructure for Science

Research methodologies, tools & data sources

Standardization & Tools

- Develop a data standard for fields, or types, of research.
- Develop a database or schema to unify data from different research projects
- Develop new data analysis or visualization tools.

BI categories and descriptions adapted from Roberts (2009)



Broaden Participation

Recruit and include under-represented groups

Women are Invisible in Data Science*

- Recruit and mentor more women in data-intensive research.
- Prioritize placing women in industry intern and assistantships.
- Work with under-represented minority groups on campuses to increase DIL skills.



K-12 Outreach & Training

Get kids and teachers excited about science

Data Information Literacy Can Start at a Young Age

- Create lesson plans for K-12 students based on rich data subsets from your research.
- Offer workshops for educators on DIL and data use in the classroom.
- Collaborate with local schools to gather data.



Training & Education

Mentor and train students in Higher Education

Demand for Data Scientists & DILiterate Researchers is Growing

- Act as a role model: consciously integrate DIL best practices into your research.
- Educate students on the *why*, not just the *how*, to build DIL skills.
- Create and share teaching modules using rich data from your research.
- Collaborate with Information Science programs by providing rich, unedited, datasets.



Public Outreach & Broad Dissemination

Share, discuss, and explain research with non-academic audiences

Make Data Accessible

- Publish data with a URI and in a repository to ensure longevity and accessibility.
- Provide data documentation and reuse policies to increase re-usability.
- Create online tools for data exploration, visualization, and analysis.
- Publish data in open formats to increase accessibility.



Societal Benefits

Can inform policy, be used by industry, or solve real-world problems

Advance Science & Industry

- Work with local governments to make data more accessible to those it impacts.
- Add data to existing government databases/share with government agencies.
- Share data with policy advisory or advocacy groups.
- Contribute to new research and industries by sharing data (e.g. "big data").



Partner & Reciprocate

Connect with those who could benefit from research

Put Data to Work

- Ensure that study participants and at-risk groups have access to relevant data.
- Work with users to create the research tools they *need* to have the highest impact.
- Increase data access to underrepresented and at-risk groups.
- Work with academic or industry partners to create new tools and applications for your data.

The Holistic Approach

The National Science Foundation's (NSF) Broader Impacts Criterion asks scientists to frame their research beyond "science for science's sake." Examining data through a Broader Impacts lens highlights the benefits of good data management, data management plans (DMPs), and strengthens the argument for better Data Information Literacy (DIL) in the sciences.

What are Broader Impacts (BIs)?

Broader Impacts (BI) are the proposed research's potential to benefit society or advance desired societal outcomes. They "can encompass both impacts for the scientific community (e.g. creating infrastructure, teaching at college level, and broadening the participation of underrepresented groups) and for society as a whole (e.g. providing a solution to a societal problem, and partnering with potential users of research results)."[†]

Why are BIs Important?

They help justify publicly funded research by providing social relevance, value, and context. They are also one of the two criteria by which NSF grant proposals are evaluated, the other being Intellectual Merit.

The Relationship between DMPs & BIs

An important part of the NSF policy on research dissemination and sharing is that "The Data Management Plan will be reviewed as an integral part of the proposal, coming under *Intellectual Merit* or *Broader Impacts* or *both*, as appropriate for the scientific community of relevance" [author emphasis].[‡]

Difficulties with Data Management & Data Sharing

Most scientists have no formal training in DIL concepts. While most scientists see the inherent value of having better data management and sharing practices there remains a population who are not interested or do not feel that changing their practices is worth their time or effort.

Potential Benefits of a Holistic Approach

Better Understanding of Data Management Plans

Placing data into a larger context should help researchers understand why DMPs are necessary, the purpose of a DMP, and what content should be included to meet requirements.

Data for the Public Good

Scientists who are reluctant to develop and deploy better data management and sharing practices may be persuaded to spend the extra time and effort once they realize that they can incorporate data into their BI statements.

Better Integration of Data Information Literacy

A BI approach to data should encourage science culture to further embrace better data management practices and data information literacy skills.

The Value of Infrastructure

Sharing data infrastructure tools (such as local standards) has the potential to greatly increase data interoperability and reuse.

Works Cited

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* Perlich, C. 2014. "Women in Data Science Are Invisible. We Can Change That." *Wired*, October. <http://www.wired.com/2014/10/women-data-science-invisible-can-change/>.

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