

Data Stewardship in Libraries: Enhancing Research Data Management Capabilities

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ABSTRACT

*As the volume of research data continues to grow, libraries are increasingly taking on a central role in managing, preserving and ensuring the accessibility of this data for future use. **Data stewardship** in libraries involves the responsible management of research data throughout its lifecycle, encompassing key activities such as data planning, storage, sharing, preservation and curation. This article explores the evolving role of libraries in enhancing **Research Data Management (RDM)** capabilities, highlighting the essential services libraries provide to support researchers in these areas. It discusses the challenges libraries face, including the need for specialized skills, infrastructure and institutional support, while also emphasizing strategies to overcome these barriers, such as collaboration, training and adoption of emerging technologies. By examining these aspects, the article underscores how libraries are uniquely positioned to support open science, reproducible research and long-term data accessibility. As research data stewardship becomes increasingly important in the academic and scientific community, libraries must continue to adapt and expand their capabilities to meet the evolving needs of data management in research.*

KEYWORDS: Data Stewardship, Research Data Management (RDM), Libraries and Data Management, Data Preservation, Data Curation, Metadata Standards, Data Management Plans (DMPs)

INTRODUCTION

An increasingly important component of academic and scientific research in recent years has been the management of research data. Researchers are creating enormous volumes of useful data that need to be managed, preserved and made accessible due to the quick growth of data generation, especially in domains like the social sciences, engineering and life sciences. Libraries, which were once thought of as the keepers of books and other conventional media are now leading the way in Research Data Management (RDM) and are essential in helping researchers manage their data.

Data stewardship involves the responsible management of research data throughout its lifecycle, ensuring data is accessible, usable and preserved for future use. This article explores the growing role of libraries in data stewardship, the challenges they face and the strategies they can implement to enhance their research data management capabilities.

The Growing Importance of Data Stewardship in Libraries

In order to guarantee that research data is properly managed, discoverable, reused and kept throughout time, a variety of actions are included in data stewardship. Libraries have long been trusted to manage information collections and as the importance of open data and reproducible research have grown, so too has their role expanded to include data management.

The significance of properly managed research data is becoming more widely acknowledged by funding organizations, government organizations and academic institutions. For instance, a lot of research funders increasingly demand that data from programs they sponsor be made publicly available or accessible through suitable repositories. Libraries now have to adjust and provide services that guarantee the long-term sustainability and accessibility of research data, as this trend has elevated data stewardship to the top of their list of duties.

Libraries are well-suited to offer data stewardship services because of their experience in managing information resources. However, in order to handle the complexity of contemporary data stewardship, libraries must create new infrastructures, policies and capabilities in response to the transition from traditional collection administration to research data management.

KEY ASPECTS OF RESEARCH DATA MANAGEMENT (RDM)

Research data management is a set of procedures and activities intended to manage research data in an accountable and methodical way. Important elements of RDM consist of:

1. Data Planning and Documentation

Planning is the first step to effective RDM. Before the study starts, researchers want instructions on how to arrange record and structure their data. Libraries can help with this by:

- **Data Management Plans (DMPs):** Libraries assist researchers in creating data management plans, a required component of many funding applications. DMPs outline how data will be collected, stored, shared and preserved throughout the research project.
- **Metadata Standards:** Libraries can help researchers use appropriate metadata standards to describe and document their data. This ensures that datasets are discoverable, understandable and reusable by others in the future.

2. Data Storage and Security

One of the most important components of RDM is data storage. Whether on institutional servers, cloud platforms or other repositories, researchers want access to dependable storage options. Libraries can help with this by:

- **Providing Storage Solutions:** Libraries can partner with IT departments to offer researchers secure storage solutions that comply with institutional and legal requirements (such as GDPR or HIPAA for sensitive data).

- **Data Backup and Redundancy:** Libraries must ensure that research data is regularly backed up to prevent loss due to hardware failure or other disasters.

3. Data Sharing and Access

Open data sharing, which enables others to validate findings and utilize the data for additional research, is one of the pillars of contemporary research. Libraries play a vital role in promoting data exchange by:

- **Repository Management:** Libraries often manage or partner with institutional repositories where data can be deposited, making it accessible to others while ensuring compliance with open-access mandates.
- **Data Access Policies:** Libraries help establish data sharing policies that ensure data is shared responsibly and in compliance with ethical, legal and funding requirements.

4. Data Preservation

Even as technology advances, long-term data preservation guarantees that data will be usable in the future. Libraries are crucial for maintaining research data since they:

- **Digital Preservation Techniques:** Libraries use a variety of digital preservation techniques, such as migration and emulation, to ensure that data remains accessible over time, regardless of technological changes.
- **Standards and Best Practices:** Libraries implement and adhere to widely accepted standards for data preservation, ensuring that datasets are not only preserved but also remain discoverable and usable.

5. Data Curation

The active process of selecting, organizing and guaranteeing the caliber of research data is known as curation. Because of their proficiency in organizing information, libraries are in a unique position to provide curation services, such as:

- **Quality Control:** Libraries can provide oversight on the integrity and completeness of datasets before they are published.
- **Data Citation:** Libraries assist researchers in understanding how to cite datasets properly, promoting academic recognition of datasets as valid scholarly outputs.

CHALLENGES IN DATA STEWARDSHIP AND RDM

While the need for data stewardship is clear, libraries face several challenges as they expand their role in research data management.

1. Skill Development and Training

The skills required for RDM are different from those traditionally taught in library science programs. Librarians must acquire expertise in areas such as data curation, metadata standards and digital preservation. This involves ongoing professional development and collaboration with experts in the field of data science and IT.

2. Infrastructure and Resources

Providing robust data management services requires significant infrastructure, both in terms of technology and staff. Libraries need to invest in:

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- **Storage and computing systems** capable of handling large datasets.
- **Software tools** that support data curation, metadata management, and preservation.
- **Dedicated staff** with the expertise to guide researchers through the RDM process and manage repositories effectively.

3. Funding and Institutional Support

RDM services require substantial institutional support in terms of funding and strategic direction. Libraries must work with university administration and other stakeholders to ensure that data stewardship is prioritized and funded adequately. This includes securing support for infrastructure, staff training and the development of long-term sustainability plans.

4. Legal and Ethical Considerations

Libraries must also navigate the legal and ethical complexities of data management. This includes issues surrounding data privacy, intellectual property rights and informed consent. Libraries can help researchers understand and comply with legal requirements by:

- Providing guidance on ethical data sharing.
- Ensuring that appropriate consent is obtained for the use of personal data.
- Assisting in the development of policies for data access and reuse.

STRATEGIES FOR ENHANCING RDM CAPABILITIES

To enhance their research data management capabilities, libraries can adopt several strategies:

1. Collaborative Approaches

Libraries can work closely with researchers, IT departments, data scientists and faculty to develop integrated services that meet the needs of the academic community. Collaboration with funding bodies and other libraries or institutions can also help libraries build stronger RDM services.

2. Training and Support Services

Libraries can offer targeted training and workshops for researchers to improve their understanding of data management, from creating data management plans to using repository systems. In addition, libraries can provide one-on-one consultations to help researchers with specific data management challenges.

3. Adopting Emerging Technologies

Libraries should adopt emerging technologies that improve RDM workflows. For instance, implementing automated data quality checking tools or adopting cloud storage solutions can help streamline data management and improve service delivery.

4. Building Robust Policies and Guidelines

Libraries should develop clear, easy-to-understand policies and guidelines for researchers on topics such as data management planning, data sharing and data preservation. These policies help ensure compliance with institutional, legal and ethical standards.

CONCLUSION

Modern research requires data stewardship, and libraries are ideally suited to assume a more expansive role in research data management (RDM). Libraries guarantee that research data is available, useable and conserved for

upcoming generations of researchers by offering services that cover data planning, storage, sharing, preservation and curation. Libraries that adopt RDM will not only enhance their services but also solidify their place as important participants in the changing field of academic and scientific research, even though there are still issues with infrastructure, skill development and institutional support.

Libraries may improve their research data management capacities and maintain their pivotal position in guaranteeing the lifespan, accessibility and integrity of research data by investing in the required resources, expertise and partnerships. Libraries must continue to innovate, adapt and set the standard for helping researchers and guaranteeing the future of open, reproducible and sustainable science as the need for responsible data stewardship increases.

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