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## Significance of Research Data Methodology and Research Data for its Effective Organization

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### ABSTRACT

Innovation and research is the important domain for the growth of any country. Researchers are the main contributor for development of country but they always work behind the scene. Every researcher collects large numbers of papers, references, and notes, and it is important to have a good system to keep them all organized. Effective organization leads to better time management and optimized utilization of resources. This paper is focused on the importance of managing research data in organized format and introduction as an effective tool for this purpose.

**Keywords:** Research Data, Data Files, References, Data Management and organization.

### INTRODUCTION: Research Data

Data are distinct pieces of information, usually formatted in a special way. Research data is data that is collected, observed, or created, for purposes of analysis to produce original research results (Pawson, R. and Tilley, 1997). Research data can be generated for different purposes and through different processes, and can be divided into different categories. Each category may require a different type of data management plan.

- **Observational:** data captured in real-time, usually irreplaceable. For example, sensor data, survey data, sample data, neurological images.
- **Experimental:** data from lab equipment, often reproducible, but can be expensive. For example, gene sequences, chromatograms, magnetic field data.

- **Simulation:** data generated from test models where model and metadata are more important than output data. For example, climate models, economic models.
- **Derived or compiled:** data is reproducible but expensive. For example, text and data mining, compiled database, 3D models.
- **Reference or canonical:** a (static or organic) conglomeration or collection of smaller (peer-reviewed) datasets, most probably published. For example, gene sequence databanks, chemical structures, or spatial data portals.

**Research data** may include all of the following:

- Text or Word documents, spreadsheets
- Laboratory notebooks, field notebooks, diaries
- Questionnaires, transcripts, codebooks, Test responses
- Audiotapes, videotapes, Photographs, films
- Slides, artifacts, specimens, samples
- Collection of digital objects acquired and generated during the process of research
- Data files and Database contents including video, audio, text, images
- Models, algorithms, scripts
- Contents of an application such as input, output, log files for analysis software, simulation software, schemas
- Methodologies and workflows
- Standard operating procedures and protocols

### **Importance of Effective Organization of Research Data**

Research data management and effective organization is an essential phase of research process. It is the responsibility of principal investigators and the research teams to address the issues related to data organization and management. By creating effective plan for managing data at the beginning of the research project leads to two major advantages as time and effort saving. Moreover, researcher can ensure that the data produced will be preserved in a clear, useable format (Kuipers, Tom, and Jeffrey, 2009). There are various advantages of effective data management which are as follows.

- Meet funding agency requirements
- Protect federal investment in research and development
- Expedite the scientific process; saving time and resources in the long run
- Use or re-use the value, the uniqueness, and the importance of data
- Ensure that research data and records are accurate, complete, authentic and reliable
- Ensure research integrity and replication
- Increase research efficiency
- Enhance data security and minimize the risk of data loss
- Prevent duplication of effort by enabling others to use your data
- Comply with practices conducted in industry and commerce

Research data are an important and expensive output of the scholarly research process, across all disciplines. They are an essential part of the evidence necessary to evaluate research results, and to reconstruct the events and processes leading to them. Their value increases as they are aggregated into collections and as they become more available for re-use to address new and challenging research questions. Without proper organization, this value is greatly diminished. Research data management is caring for, facilitating access to, preserving and adding value to research data throughout its lifecycle. Research data management involves effective planning for different phases of its lifecycle. This lifecycle is comprised of six phases as shown in Figure 1.

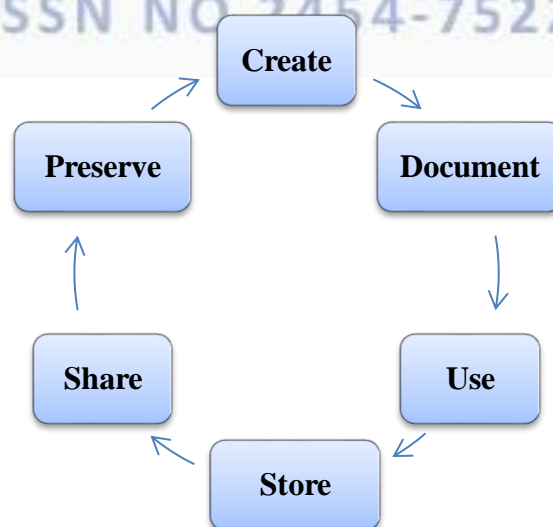


Figure 1: Research Data Management Lifecycle

In this lifecycle, creating data deals with the type and format of data. Documenting data tells about providing information to users to understand the data. Accessing / using data deals with organization of data. Storage is concerned with saving data safely and securely during your project. Sharing data is making data publicly available and preserving data tells that how will you preserve your data.

### **Organizing References and Data Files**

In research work references are given whenever a source, which supplies some kind of fact or evidence, is used. Researchers need to show their awareness of previous and related research within the field with the help of references. In some disciplines, essays and research papers have a designated part for previous research, whereas such acknowledgements may be given anywhere in the text in other disciplines. During the research process references grow as research progress and it becomes an important job for the researcher to organize, store and preserve references for future use. Similarly, Data files play an important role in the research process (Savage, Caroline J., 2009). Data file are the files that contains digitized audio/video, graphic and text information arranged in a coded form and a specific file format dictated by the program that created it. It can be read or used only by the same or a compatible program.

The data files and references are the important resource and asset for the researcher for research work. The proper organization and management of data files directly affect the time span of research work as these files are referred again and again in the different research phases. Research is the process which covers each and every aspect of life such as sciences, social sciences, pharmaceuticals, education, fine arts, human behaviour and psychology etc. If the data files and references are not organized in proper format and in common place then it is not easy for them to refer to the material easily. Increase in search time drastically effect the performance and time efficiency for completing the research project. All the researchers who are associated with the research work may or may not know the computerized methods to organize their data. There exists variety of tools for organizing references and data files collected by the researches. The tools are

effective and independent of the field in which the research work is carried out. They not only organize and store data but also preserve it for future.

### **Tool for Effective Organization of Research Data**

Mendeley is a **free reference manager** and academic **social network**. It is useful to make user defined own **fully searchable library** in seconds. It provides **citation** as researcher write, and **read and annotates** all data files in PDFs on any device. Mendeley is a desktop and web program for managing and sharing research papers, discovering research data and collaborating online. This tool is available for Windows, OS X and Linux operating systems. Mendeley requires the user to store all basic citation data on its servers storing copies of documents is at the user's discretion. Upon registration, Mendeley provides the user with 2 GB of free web storage space. Every researcher collects large numbers of papers, references, and notes, and it is important to have a good system to keep them all organized. Mendeley is a free software tool for managing your reference database. It actually solves many problems simultaneously and is likely to become an important part of research work (Sodiya, and Afolunso, 2009). It provide following main features.

#### **Managing pdfs**

It automatically collates, organize and manage all files in having pdf format. It also extract authors, titles, publication details, and set up database for user and provide search for papers by author, journal, title, etc.

#### **Managing citations**

Mendeley also takes care of bibliography generation. It will automatically maintain LaTeX and BibTeX files. It will allow referencing in MS Word also using Word plug-in.

#### **Web-based references**

It has a web interface which is synced with user's desktop database. So user can access references on any computer connected to the internet. If researcher is browsing a website such as ScienceDirect, JStor or Google Scholar, and find a reference to add to database then there is a book market which automates the process.

## Sharing references

It provides social network feature to network with other researchers to share thoughts, experiences, ideas and results with each other. This feature is helpful for authors and co authors to work together and for the researchers who are under simultaneous or parallel research fields.

## CONCLUSION

Research data is the most important resource for research work in any discipline. Research data mainly comprised of two major components as references and data files. Researcher in his entire timeline refers to these resources many times for literature survey, analyzing data, result formulations and for writing research material. Therefore, it is mandatory to organize the research data in effective manner. Better organization reduces the access time to refer to material and also increases the reusability of research material. This paper covered the importance and steps for organizing research data and introduced the features of tool named Mendeley to automate this task.

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