EMERGING TRENDS AND TECHNOLOGIES IN LIS EDUCATION DURING COVID-19 ERA

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Data Sharing Perceptions among Chemists in Federal Universities of Technology in Nigeria

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Abstract

The study examined data sharing perceptions among chemists in federal universities of technology in Nigeria namely: the Federal University of Technology Minna, Federal University of Technology Owerri, Federal University of Technology Akure, Modibbo Adama University of Technology Yola, and Abubakar Tafawa Balewa University Bauchi. Data sharing ensures that research data remain findable and usable for a long time within the scientific community. An exploratory research design was adopted to understand the perception of chemists on data sharing. An interview schedule was used to gather data from the respondents and thematic analysis was done using the Provalis Qualitative Data Analysis (QDA) software. The total population of the study was 40 respondents and the sampling technique used was the total enumeration method. Findings revealed that chemists are willing to share research data provided there are effective copyright systems in place. They are also willing to share analysed data after publication. The study recommended that the library should intensify advocacy on the benefits of data sharing which could also serve as a preservation method and as a sustainable means of collaboration within the scientific community.

Keywords: research data, data sharing, chemists, open data, federal universities of technology, Nigeria.

Introduction

Data are collections of facts, concepts, numbers, words, measurements, observations, or instructions in a formalised manner which should be suitable for communication, interpretation, or processing by a human or electronic machine. Data that are collected and presented in a form that the computer system can understand are referred to as digital data. Data vary across disciplines: they can be numeric, textual, audio, video, and graphic. They can also be samples (such as Deoxyribonucleic acid (DNA), blood), physical collections (plant specimens, animal samples), software codes and programmes, algorithms, geospatial data, databases, modules, reports, experimental observations, survey results and interview transcripts, instrument measurements, laboratory notebooks, to mention but a few. Hence, data generated during the conduct of any research for sharing and reuse is known as research data.

Research data cover a broad range of types of information and digital data can be structured and stored in a variety of file formats. Pienaar and VanDeventer (2015)

defined research data as the recorded factual material commonly accepted in the scientific community as necessary to validate research findings. They are data collected, observed or created for analysis to produce and validate original research results. Research data can be in the form of facts, observations, images, computer programme results, recordings, measurements or experiences on which an argument, theory, test or hypothesis, or another research output is based (Pienaar and VanDeventer, 2015). Research data are valuable products of the scientific enterprise that historically have not been well preserved or archived. International sponsors and scientific journals are now encouraging or requiring sound data management and data sharing before granting funds or accepting the article for publication indicating how critical effective data management practices are to the scientific research processes (Thoegersen, 2015; Schubert *et al.;* 2013 and Sheehan, 2016).

It is important to study the data practices of researchers especially data accessibility, discovery, re-use, preservation and, particularly, data sharing. This is to understand their perception and to guide the Research Data Management (RDM) stakeholders in decision-making that would enhance the standard of research processes within the scientific community (Abduldayan *et al*, 2021). The RDM stakeholders include the researchers, library, university management, information technology service (ITS) unit, and the research and development (R&D) unit.

Data sharing is a valuable part of the scientific method allowing for verification of results and extending research from prior results(Tenopir et al., 2011). Also, funders have recognized the importance of sharing data and have implemented policies and mandates that encourage researchers to share. This is because shared data can be repurposed and used in novel ways, thus increasing the return on investment for funded research(Federer, Lu, Joubert, Welsh, & Brandys, 2015). Despite the many arguments in favour of sharing and open science, researchers often do not share their data. According to (Federer et al., 2015), several concerns may dissuade researchers from sharing, including concern over other researchers beating the original data collector to publication, fear that others may question the data collector's findings or conclusions, and worry about people misusing or misinterpreting the data. It is based on this premise that this study hopes to understand the perception of chemists in federal universities of technology in Nigeria on data sharing. The findings of the study are used as a guide towards understanding their research data management practice and for libraries to roll out relevant research data management services in Nigeria.

Methodology

Exploratory research design using the qualitative (interview) method of data collection and analysis was used to understand the perception of chemists in the five federal universities of technology in Nigeria. The population of the study comprises the entire chemists from the Department of Chemistry with a Ph.D. or currently undergoing doctoral programme across the available options in chemistry in Nigeria. The interview was oral and face-to-face and responses were recorded using an audio recorder.

Respondents were given an informed consent form to fill out to assure them of the confidentiality of responses and other related issues. Interviews lasted for approximately thirty minutes while the least response time was about nine minutes depending on the respondents' knowledge of the questions asked. A Research Assistant was employed to assist with the audio recording and to ensure that informed consent forms were properly filled and collected. All interviews were conducted in the respondents' workplace after an agreed day and time which was usually about 9 am-4 pm of any working day. The data gathering process took approximately three months from August to October 2019 due to the distance involved in travelling across the six geopolitical zones in Nigeria where the FUTs were located.

For the data transcription and analysis, the study adopted the Braun and Clarke (2006) thematic analysis approach which involves a six-phase of qualitative data analysis. These phases are: transcribing data, generating initial code, searching for themes, reviewing themes, defining and naming themes, and finally presenting the final report of the analysis.

Data collected from chemists across FUTs in Nigeria were manually transcribed verbatim; this was followed by the initial coding of the transcribed data. In addition, the *Provalis* Qualitative Data Analysis (QDA) Miner (Version 5) software was used for generating themes and subthemes from the coding framework and the final report is presented in the figures below.

Results and Discussion

Breakdown of Chemists into Ranks and Options

Table 1 shows the breakdown of chemists into their respective ranks and options across FUTs in Nigeria.

Table 1: Rank and Options of Chemists across FUTs in Nigeria

S/N	University	Rank of Respondents	Options in Chemistry	Number of Respondents
1.	**ATBU**	Professor – 1 AP/Reader – 3 Senior Lecturer – 2 Lecturer I – 1	Organic, Environmental, Physical, Inorganic, Analytical Chemistry.	7
2.	**FUTA**	Professor – 1 AP/Reader – 1 Senior Lecturer – 2 Lecturer II – 4	Food, Environmental, Petroleum, Geochemistry, Analytical, Industrial, Polymer Chemistry.	8
3.	**FUTMIN**	Professor – 1 AP/Reader – 3 Senior Lecturer – 3 Lecturer I – 2 Lecturer II – 2	Analytical, Polymer, Organic, Environmental, Nano chemistry.	11

4.	**FUTO**	Professor – 2 AP/Reader – 1 Senior Lecturer – 3 Lecturer II – 2	Organic, Analytical, Physical, Environmental, Polymer, Computational Chemistry.	8
5.	**MAUTECH**	Professor – 1 AP/Reader – 2 Lecturer I – 2 Lecturer II – 1	Polymer, Physical, Organic, Environmental, Analytical Chemistry.	6
	TOTAL			40

Perceptions of Chemists on Data sharing

This section reveals perception of chemists on data sharing and transfer of ownership of data. Figure 1 shows the subthemes under data sharing:

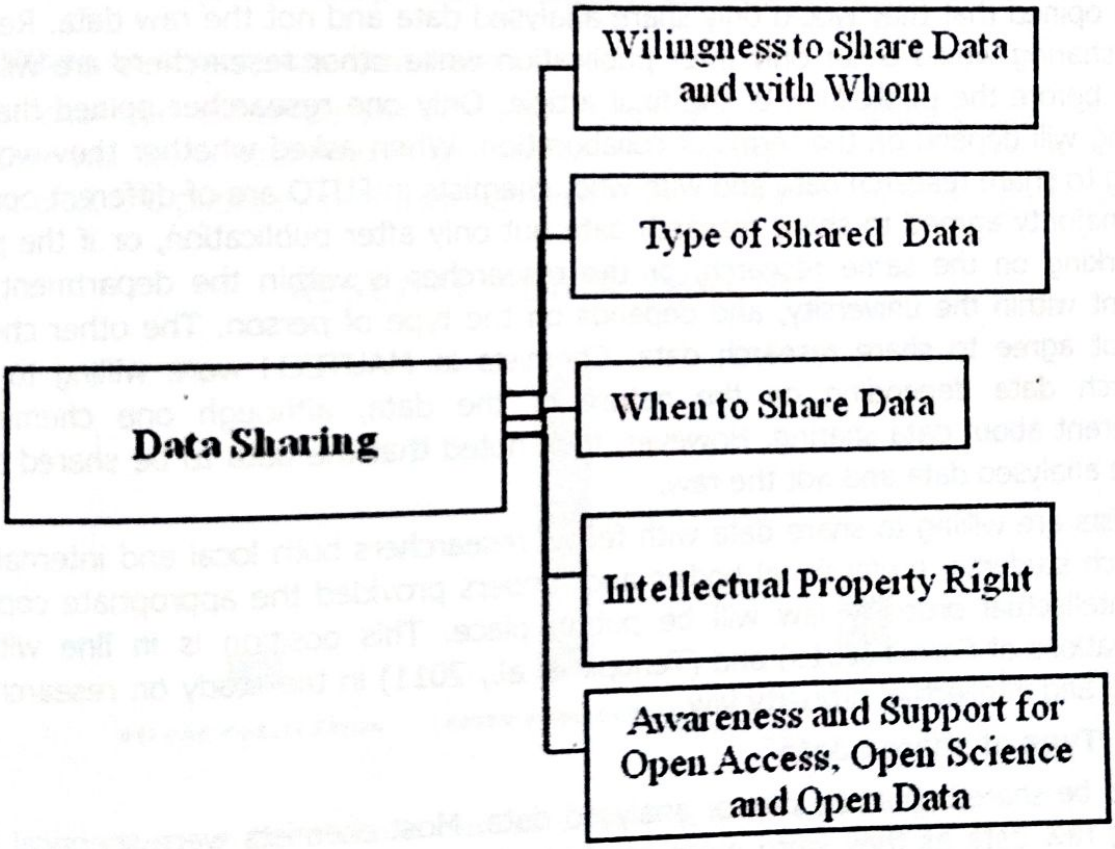

Figure 1: Perception of Chemists on Data Sharing

i. Willingness to share data with another user

On the willingness to share research data, there are mixed reactions as deduced from researchers' responses. Some researchers believe that once an article is published, research data is also shared automatically. This assumption is not true for most articles, as published articles are usually not sufficient to replicate a study or verify its findings. There is the need for giving appropriate access to the underlying data of an article

either employing a special requests to the author or simply through open data repositories. However, the majority of chemists in ATBU agreed to only share data after the article has been published; and it is only a part of the data and not the entire dataset.

> *"If you pick up my publication you will see my data"*
>
> *"Inside the publication, you find the data, but you talk about the raw data that you generate from the lab? No! it has to pass through some process"*

Chemists in FUTA would share data with their research students and fellow researchers. They will also collaborate internationally and share research data based on clearly specified terms and conditions. They are however willing to share raw or analysed research data only after the publication of their findings. The majority of FUTMIN chemists are willing to share research data. Others will only share data from research that is not sponsored and with fellow researchers at home and abroad. However, some researchers are simply not willing to share their research data. Those that are willing to share opined that they would only share analysed data and not the raw data. Research data sharing would occur only after publication while other researchers are willing to share before the publication of the final article. Only one researcher opined that data sharing will depend on the terms of collaboration. When asked whether they would be willing to share research data and with who, chemists in FUTO are of different opinions. The majority agreed to share research data but only after publication, or if the person is working on the same research, or the researcher is within the department, or a student within the university, and depends on the type of person. The other chemists did not agree to share research data. Chemists in MAUTECH were willing to share research data depending on the nature of the data, although one chemist felt indifferent about data sharing. However, they noted that the data to be shared should be the analysed data and not the raw.

Chemists are willing to share data with fellow researchers both local and international, research students, professional bodies and funders provided the appropriate copyright and intellectual property law will be put in place. This position is in line with the observations of Carroll (2015) and (Tenopir et al., 2011) in the study on research data sharing and intellectual property law.

ii. Type of shared data

Data to be shared could be raw or analysed data. Most chemists were sceptical about sharing raw data as they were more comfortable with sharing processed or analysed data. This is depicted in Figure 2:

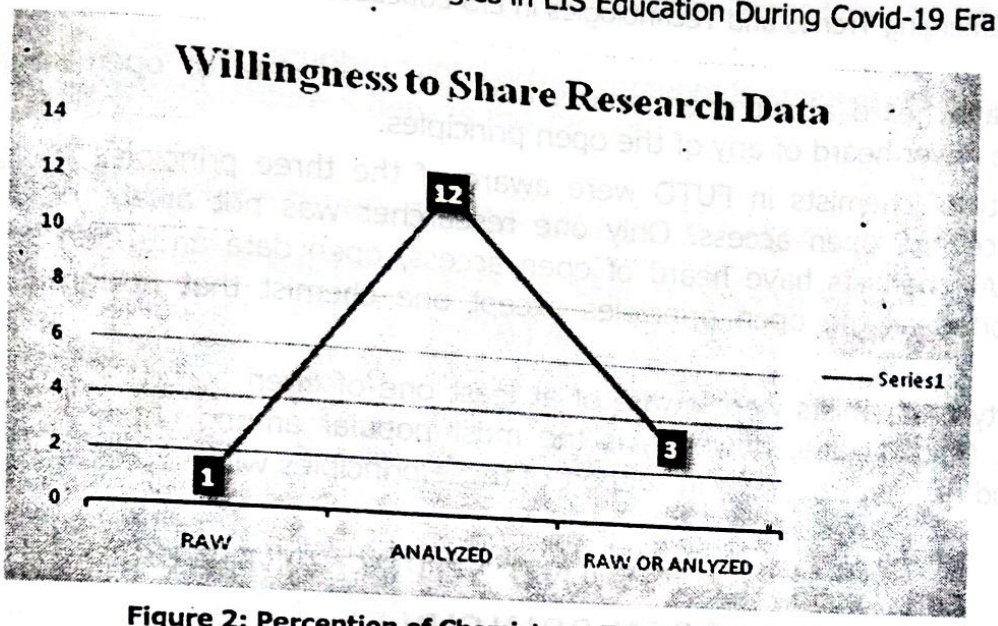

Figure 2: Perception of Chemists on Type of Data to Share

iii. When to share research data

Research data can either be shared before or after the publication of the research work. Chemists were interviewed on whether they would prefer to share their data before or after the publication of their research work. Figure 3 shows their preference:

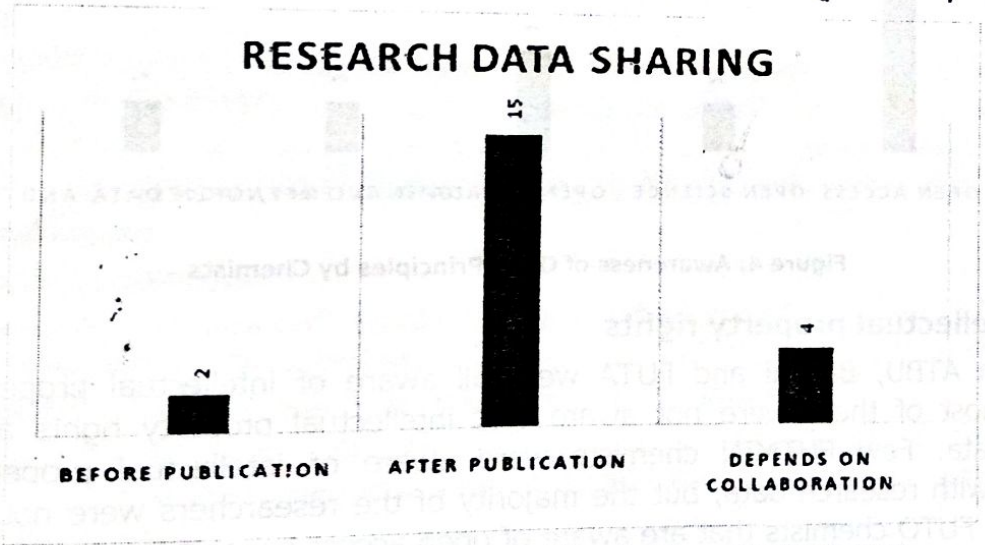

Figure 3: Perception of Chemists on When to Share Research Data

iv. Awareness and support for open access, open science, and open data

Chemists in ATBU Bauchi were aware directly or indirectly of the principles of open access, open data and open science, they, however, did not support them in their entirety because of the issues of trust and attitude of fellow researchers in Nigeria. The majority of chemists in FUTA were aware of open access but only a few were aware of open data and open science. They however agreed to the principles of open access to published articles only and were not in support of open data. In FUTMIN, some of the

chemists have heard about open access and not open data or open science while others have never heard of any of the open principles.

The majority of chemists in FUTO were aware of the three principles of open data, open science and open access. Only one researcher was not aware of any of the principles. All chemists have heard of open access, open data and open science and they supported all the open principles except one chemist that disagreed with the principles.

The majority of chemists were aware of at least one of open access, open science or open data. Open access, however, is the most popular among chemists as seen in Figure 4 and respondents were in support of these principles with few exceptions.

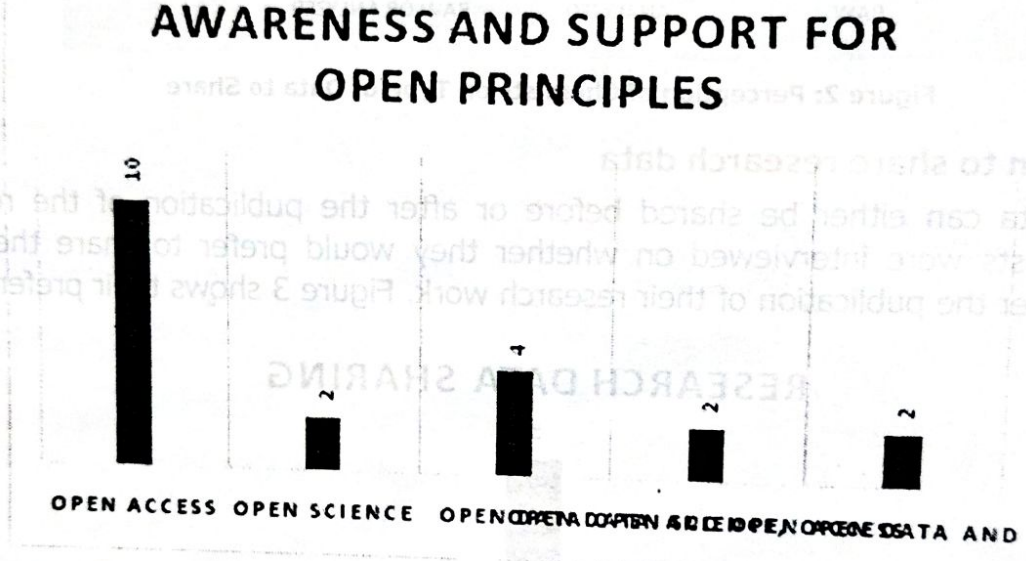

Figure 4: Awareness of Open Principles by Chemists

iv. Intellectual property rights

Chemists in ATBU, Bauchi and FUTA were all aware of intellectual property rights although most of them were not aware that intellectual property rights also cover research data. Few FUTMIN chemists were aware of intellectual property rights associated with research data, but the majority of the researchers were not aware of such rights. FUTO chemists that are aware of open access support the principle but will only participate provided there are regulations and appropriate intellectual property rights. MAUTECH chemists are aware of intellectual property rights but have no idea of research data rights.

The majority of chemists were aware of intellectual property rights; however, a handful was unaware of intellectual rights associated with research data. In addition to this, chemists highlighted that due to their ignorance, their intellectual rights were sometimes deliberately exploited. This concern requires that the library should roll out awareness programs on the availability of copyright and intellectual property law that protects researchers' interest against unauthorised access and use of their work. The

role of library in ensuring security of intellectual contents is supported by the study of Abduldayan *et al* (2019). Figure 5 depicts this further.

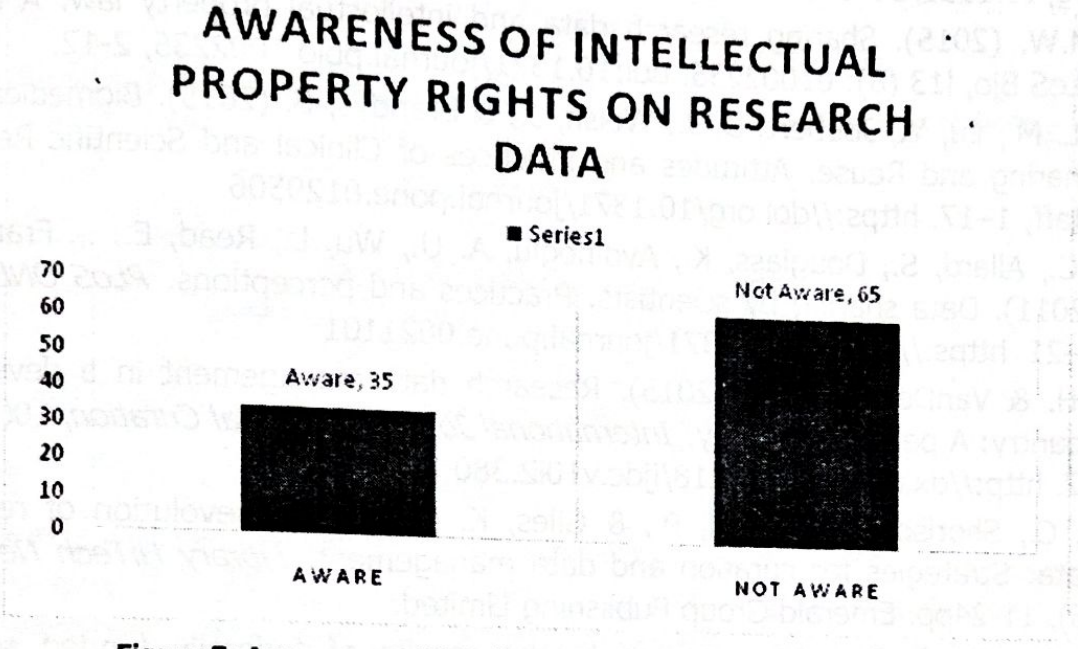

Figure 5: Awareness of Intellectual Property Rights by Chemists

Conclusion

This study concludes that the library needs to increase awareness of the importance of data sharing in the scientific community. Researchers should be made to understand that data sharing could serve as a way of long-term preservation, effective collaboration, and increased visibility to data owners through appropriate data citation.

Recommendations

The study recommends that:

1. The university management should propose and implement a policy that supports data sharing within the university. There should also be an incentive attached to effective data-sharing practice by researchers in the university.
2. The library should roll out advocacy and seminars on the benefits of data sharing especially as it is now been encouraged by funding agencies and impact factor journal publishers.

References

Abduldayan, F.J., Abifarin, F.P., Oyedum, G.U., & Alhassan, J.A. (2019). Research data management and information security: Role of library and information technology service (its) units in federal universities of technology in Nigeria. *Journal on Information Technology,* 8(1), 20-28.

Abduldayan, F.J., Abifarin, F.P., Oyedum, G.U. & Alhassan, J.A. (2021). Research data management practices of chemistry researchers in federal universities of technology in Nigeria. *Digital Library Perspectives,* 37(1), 70-90. https://doi.org/10.1108/DLP-06-2020-0051. Emerald Group Publishing Limited.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Carroll, M.W. (2015). Sharing research data and intellectual property law: A Primer. PLoS Bio, l13 (8): e1002235. doi:10.1371/journal.pbio.1002235, 2-12.

Federer, L. M., Lu, Y., Joubert, D. J., Welsh, J., & Brandys, B. (2015). Biomedical Data Sharing and Reuse: Attitudes and Practices of Clinical and Scientific Research Staff, 1–17. https://doi.org/10.1371/journal.pone.0129506

Tenopir, C., Allard, S., Douglass, K., Aydinoglu, A. U., Wu, L., Read, E., ... Frame, M. (2011). Data sharing by scientists: Practices and perceptions. *PLoS ONE, 6*(6), 1–21. https://doi.org/10.1371/journal.pone.0021101

Pienaar, H. & VanDeventer, M. (2015). Research data management in a developing country: A personal journey. *International Journal of Digital Curation*, 10(2), 33-47. http://dx.doi.org/10.2218/ijdc.v10i2.380

Schubert, C., Shorish, Y., Frankel, P., & Giles, K. (2013). The evolution of research data: Strategies for curation and data management. *Library HiTech News*. 30 (6), 11-24pp. Emerald Group Publishing Limited.

Sheehan, J. (2016). Increasing access to the results of federally funded science. Retrieved from https://obamawhitehouse.archives.gov/blog/2016/02/22/increasing-access-results-federally-funded-science

Tenopir, C., Allard, S., Douglass, K., Aydinoglu, A. U., Wu, L., Read, E., ... Frame, M. (2011). Data sharing by scientists: Practices and perceptions. *PLoS ONE, 6*(6), 1–21. https://doi.org/10.1371/journal.pone.0021101

Thoegersen, J. L. (2015). Examination of federal data management plan guidelines. *Journal of Science Librarianship,* 4(1), 56-74pp. http://ax.doi.org/10.7191/jeslib.2015.1072