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Developing research data management services in a regional comprehensive university: The case of Central Washington University

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Developing a Research Data Management Service in a Regional Comprehensive University: A Case of Central Washington University

Abstract

This study aims to analyze the needs of researchers in a regional-comprehensive university for research data management services (RDS), discuss the options for developing an RDS program at the university, and then propose a phased three-year implementation plan for the University Libraries. The method was to design a survey to collect information from researchers and assess and evaluate their needs for RDS. The results showed that the researchers' needs in a regional-comprehensive university could be quite different from those of researchers in a research-intensive university. Also, the results verified the hypothesis that researchers in the regional-comprehensive university welcomed the Libraries to offer managed data services for the research community. Therefore, this study suggested a phased three-year implementation plan. The significance of the study is it can give some insights and helpful information to those peer regional-comprehensive universities planning to develop an RDS program.

Keywords: *research data management services (RDS), needs assessment and evaluation, regional-comprehensive university*

Introduction

Today more data is being created and used in a myriad of ways than ever before in recorded history. Individuals and businesses use electronic devices and the internet to generate and consume data (Aaronson and Leblond, 2018). Researchers and academics also produce large datasets in their scholarship (Muellenbach, 2021). Researchers have access to tools to parse information and text mine the data in ways never imagined before by using computers and complex algorithms to examine a corpus of documents or other data sets (Kantardzic, 2011). It is a big challenge for academics, individuals, and businesses to organize, curate, store, share, use and reuse information and data. Research Data Management Services (RDS) at academic institutions is a systematic resolution for dealing with this challenge.

RDS has been defined as any concrete and programmatic offering intended to support researchers (including faculty, postdoctoral researchers, and graduate students) in working with data (Perrier and Barnes, 2018). One of the first schools to see the need for academic institutions

to provide RDS was the Wharton School of Business at the University of Pennsylvania. The Wharton Research Data Services (WRDS) began in 1993 and have grown over time (Wachowicz, 2020).

Libraries are situated to offer RDS and play critical roles in managing these services (Tenopir et al., 2014; Yu, 2017). Many research libraries developed RDS. RDS can take many different forms depending on the needs of institutions. The RDS programs at research libraries focus on providing data instruction and consultation services for helping researchers with their data management plan, data visualization, and storage solutions so researchers can meet funder and publisher requirements for storing, sharing, and reusing data (Dietrich et al., 2012; Conrad et al., 2017; Borghi and Van Gulick, 2018). Some research libraries also offer specific data services with a variety of disciplinary, methodological, and technical focuses (Grajek, 2011; Lembinen et al., 2017).

Most research studies investigating the role of the libraries in developing an RDS have been performed in research university contexts (Tenopir et al., 2014; Yu, 2017; Yoon and Schultz, 2017; Murray et al., 2019). To date, few studies have examined the role of the libraries in implementing an RDS in regional-comprehensive university contexts. Compared with research universities, faculty members and researchers in regional-comprehensive universities have fewer workloads allocated to research and scholarship. They also have fewer opportunities to apply for and receive larger external grants. Such gaps imply that their RDS requirements could be different from that of researchers in the research universities.

Given these research gaps mentioned above, this study aimed to understand the researchers' data needs at regional-comprehensive universities, explore the role of the libraries in developing

an RDS program, and determine what types of data services should provide by the regional-comprehensive university libraries.

Literature review

Over the past years, there has been exponential growth in the amount of data available to researchers and created by researchers (Flannery et al., 2015). Tools are now available for text and data mining and visualizing the vast amounts of data generated by individuals, government, and corporate entities (Hinrichs et al., 2015; Cortés Sánchez, 2018; Wan-Hsu and Jia-Yu, 2019). Research activities create large data sets unheard of before the vast computing power of today. Scientific data doubled every ten to fifteen years (Bornmann et al., 2021). There has also been a trend among granting agencies to require grant recipients to manage and preserve their data (Perrier et al. 2017). As early as 2013, the United States Office of Science and Technology Policy began urging researchers to preserve their data and make it available to other researchers (Office of Science and Technology Policy, 2013). Europe has an Open Research Data Pilot Project for participating projects to manage their data and promote data sharing (Watson, 2014). Thus, academics need to proactively manage the data associated with their research and scholarship (Willaert et al., 2019). Currently, data is not well managed and the availability to produce the datasets associated with research declined by 17% per year (Vine et al. 2014: 95).

Research data needs to be curated and organized and can be useable and reusable (Tenopir et al, 2015). Hey and Trefethen (2003: 809) argued, "To be exploited by search engines and data mining software tools, such experimental data needs to be annotated with relevant metadata giving information as to provenance, content, conditions and so on." Many faculty have difficulty creating simple metadata for their research articles. Creating complex and well-crafted metadata will often involve librarian assistance (Whitmire et al., 2015).

The faculty's lack of comfort with technology may also contribute to a lack of data management (Mancilla et al., 2019). In examining research faculty's use of technology in other areas, the research in Ghana shows that performance anxiety could be a factor that faculty were reluctant to use a Learning Management System (Bervell and Umar, 2020). Ellis (2000) pointed out that the time commitment to learning new technology often prevents faculty from using it. Not only do faculty feel it takes time they don't have to learn new technology, but they also do not know where to go for help. In many research libraries, academic librarians' roles have evolved from providing traditional reference services to serving as liaisons to academic departments and becoming embedded in the academic research process (Ducas et al., 2020; Costello, 2020).

Librarians also need to be trained to educate researchers on how to use and curate data (Conrad et al., 2017). Research data services is a growing field for academic libraries (Koltay, 2017; Cox et al., 2019; Mannheimer et al., 2019). A survey conducted by the Association of College & Research Libraries showed that most research libraries provided data services to help their researchers to meet the National Science Foundation (NSF) requirement of data management plans (DMP) (Antell et al, 2014: 562).

Librarians have the organizational skills to become excellent stewards of the data but often need training and support to provide data services (Davis and Cross, 2015). A survey of the relevant publications about RDS in academic libraries shows that the most successful providers of RDS recruit internal and external stakeholders and provide the training for library staff to support the services (Tenopir et. al. 2017; Yu, 2017). Librarians need the training to learn how to curate data and promote RDS services to their institutions. A study of six academic libraries implementing data services found that providing data service-related educational modules to the librarians was effective and made librarians feel comfortable teaching data management classes

(Muellenbach, 2012). Librarians often perform RDS services integrating with a liaison or embedded librarianship duties, such as assistance in finding data portals, writing data management plans, and teaching and promoting data management services (Antell et al. 2014).

A recent survey of user needs at research universities found researchers needed the most assistance with quantitative analysis and data visualization. The survey also found researchers rarely used metadata schema but did follow a standard file naming scheme (Joo and Peter, 2020). While a regulated file naming system scheme is necessary, applying a good metadata schema makes the data more useful by allowing more in-depth searches and text mining (Medina-Smith et al., 2021).

Another article examining the role of libraries in conducting research data services found libraries worldwide offer better RDS when libraries take a lead role in developing institutional policy around data. Libraries also enhance their data services by engaging stakeholders on campus and externally (Kim, 2021: 7).

There have been extensive surveys of Chinese libraries in recent years to evaluate the extent of data services and the needs of libraries to provide quality data services. In a survey of 87 academic libraries, 50 of the surveyed libraries offered some form of research data management. Some of the early findings were that offerings of research data services in order of popularity were: research data introduction, data curation, data management guidelines, data management reference services, resource management, and data management training (Si et al., 2015). A follow-up survey in 2019 of 76 libraries offering RDS found the services had seven distinct aspects: research data management, open access, scholarly publishing, research impact measurement, research guides, research consultation, and research tools recommendation (Si et al., 2019).

This study gained insights from the existing research and articles reviewed above. The study adapted some survey questions (Joo and Schmidt, 2021) and redesigned them to collect information from the researchers at a regional-comprehensive University, Central Washington University (CWU), in the USA.

Methods

Participants:

The Provost Office sent out the online email survey via the university email system to all faculty members, research associates, staff, and graduate students in February 2021. The study set a one-month timeframe to collect the survey data by March 15, 2021.

There were 263 tenured (T) faculty members, 99 tenure-track (TT) faculty members, 341 non-tenure-track (NTT) faculty members, 11 Research Associates (RA), 1,188 staff, and a total of 123 graduate students in the academic year AY20-21 at CWU.

Initially, 70 responded to the survey. Among the 70 responses, 50 were from TT&T faculty, 16 from NTT faculty, 1 from RA, 1 from staff, and 2 from graduate students. Table 1 presents the participant's categories, the response counts, and the total number of each group.

Table 1: Participants and response rate

Categories	Count	Total Numbers	Response Rate
Tenure Track & Tenured	50	362	14.00%
Non-Tenure-Track	16	341	4.70%
Research Associate	1	11	9.09%
Staff	1	1188	0.00%
Graduate Students	2	123	1.63%
Total	70	2025	

In general, TT&T faculty are mandatory to conduct research and publish. The response rate from the TT&T faculty was approximately 14%. According to Fan and Yan's study (2010: 132),

the average response rate in the web survey is about 11%, which is lower than that of other survey modes. So the response rate from the TT&T faculty was considered realistic and acceptable.

NTT faculty members at CWU have no mandatory scholarship requirements. The response rate from the NTT faculty group was approximately 5%, which let the Libraries know there were some NTT faculty still actively involved in scholarship and research activities.

RA staff at CWU have scholarship requirements. Only two programs at CWU have a total of 11 RA staff. The response rate from the RA staff was approximately 9.09%, a little bit lower than the average rate that Fan and Yan's study (2010:132) found.

CWU does not provide doctoral degree programs. Most graduate programs at CWU are course-based and project-based master's degree programs. A few programs are research-based master's degree programs. So the response rates from graduate students were pretty low in his study.

Staff at CWU has no research and publish obligations. The only staff participant just completed the first three questions and did not respond to the rest of the questions. So this study erased this non-valid response. In summary, 69 participants completed the survey.

The participants' ages ranged from under 24 to 65 and older, with a mean of 41.27 and a standard deviation of 1.11.

Instruments, Data Collection, Processing, and Analysis:

A survey was designed to collect feedback from CWU researchers to answer the following questions: What are the data needs at CWU? How will the Libraries help in research at CWU? Should the Libraries provide RDS for the CWU research community? If the answer is yes, how will the Libraries implement RDS? What data services should the Libraries provide?

This study adapted some questions from Joo and Peters' study (2019) and purposely redesigned a survey for CWU researchers.

Questions 1 to 3 were for collecting participants' research areas, faculty ranks and status, and ages. Question 4 was for funding and grant. Question 5 was for the data management plan. Question 6 was about data privacy. Questions 7 to 10 were for types of data assistance researchers received on campus. Questions 11 to 12 were for understanding the needs of the University Libraries to provide research data services and researchers' willingness to receive such a service. Questions 13 to 16 were for data format, backup strategies, storage solutions, and long-term storage needs. Question 17 was to ask if researchers would be willing to share their data or not. Question 18 was an open question for researchers to provide suggestions regarding research and data management. Please refer to Appendix I for detailed survey questions. AQualtricsonline survey tool was used for collecting, processing, and analyzing data.

Results

Among sixty-nine responses, eighteen respondents (26.09%) confirmed that their research funds were from grants. Only twelve researchers (17.39%) confirmed that their funding agencies required them to provide a Research Data Management Plan (DMP) when they submitted their funding applications.

Thirty-nine (56.52%) researchers confirmed that they did receive assistance on campus for research and data management; however, only seven researchers (10.15%) reported they received help from the Libraries.

About fifty researchers (72.46%) admitted no concerns for their data privacy; however, nineteen researchers (27.54%) expressed data privacy concerns such as being anonymous, people's identities, approval from the data vendor to share if they purchased from a data vendor.

About twenty-five researchers (36.23%) responded that they would like the University Libraries to provide RDS. However, when asking if the Libraries provided the RDS, would they use it? Forty-two researchers (60.87%) said yes to this question.

Regarding what areas researchers would like to have assistance from the Libraries, which was a multiple-choice question, among a total of 146 answers, finding resources to inform and enhance their research projects was the first-place answer. Finding existing datasets was the second-place answer. Assistance in conducting quantitative data analysis, assistance in helping with data visualization, and, finding an appropriate repository for data archives were a tie for third-place answers. Table 2 presents the areas of research processes and activities that researchers would like the Libraries to provide.

Table 2: What areas of research processes and activities would researchers like to have assistance with from the Libraries?

Areas	Count	Percentage
Finding resources to inform and enhance your research projects	31	21.23%
Finding existing datasets	19	13.01%
Finding an appropriate repository for data archives	14	9.59%
Quantitative data analysis	14	9.59%
Data visualization	14	9.59%
Data management plans	11	7.53%
Data refinement or cleaning	11	7.53%
Data documentation	11	7.53%
Qualitative data analysis	10	6.85%
Meeting funder mandates for sharing research data	9	6.16%
other	2	1.37%
Total	146	

Regarding data format, the top 5 formats were Tabular or spreadsheet, textual data, images, audios, and videos. Table 3 presents what data format researchers generate in their research.

Table 3: What data format do researchers generate in their research?

Format	Count	Percentage
Tabular or spreadsheet data (e.g. CSV, MS Excel)	40	25.81%
Textual data (e.g. TXT, MSWord)	27	17.42%
Image files (e.g. JPEG, TIFF)	23	14.84%
Audio files (e.g. WAV, MP3)	18	11.61%
Video files (e.g. AVI, WMV, MP4)	15	9.68%
Geospatial data	14	9.03%
Artifacts, samples, and/or specimens	7	4.52%
Semi-structured format data (e.g. XML, JSON)	7	4.52%
Genomic data	0	0.00%
Other (Python, etc.)	4	2.58%
Total	155	

Table 4 presents where researchers stored their data. The first choice was using cloud storage such as Dropbox and Google Drive. Also, many researchers chose external storage, university server, lab computers, and department or college servers.

Table 4: Where do researchers store their data?

Where	Count	Percentage
Cloud Storage (e.g. Dropbox, Google drive)	26	26.53%
External Storage	24	24.49%
University Sever	12	12.24%
Lab Computer	11	11.22%
Department or College Server	11	11.22%
External Data Repository	5	5.10%
Library Repository	1	1.02%
Other	8	8.16%
Total	98	

In summary, researchers did receive help with their research data from various units on campus. The most needed service at CWU is to help researchers find information and dataset related to their research projects. The Libraries are welcome to provide the RDS services for the

research community at CWU. Meanwhile, the RDS should protect the privacy of sensitive and personal data. However, neither data deposit service nor DMP support is the most needed service at this moment at CWU.

Discussion

The survey results addressed the research questions that this paper proposed, gave the Libraries a clear picture of CWU researchers' RDS needs, and helped the Libraries decide what RDS services should provide and how to implement them. Here are some discussion points that the study would like to emphasize:

Yoon and Schultz (2017) analyzed 185 research university libraries' websites and found data deposit was the top service that research libraries provided. Also, Murray et al. (2019) claimed that the data repository service was in second place among the most offered services by the research libraries after they conducted a survey of the state of RDS for 35 U.S. research university libraries. However, the survey results showed that the data deposit service is the third-place (tie) of the most needed services at CWU.

Murray et al. (2019) also found that offering research data instruction was the most needed service at research libraries; however, it is not the case at CWU either, and even not on the top 5 list of the most needed services. Also, Yoon and Schultz (2017) found that DMP support was the second place of the most offered services at research libraries. But this study showed that DMP support is the sixth-place in the most needed service at CWU.

Joo and Peter (2020) also found researchers needed the most assistance with quantitative analysis and data visualization from their study at one public R1 university; however, the survey results showed this type of assistance was the third-place among the most needed services at CWU.

The survey results helped the Libraries understand the specific needs of CWU researchers. Therefore, the Libraries should consolidate current resources, explore other RDS resources and tools, develop a list of most needed RDS services, and promote them to the CWU research community. Prospectively, the survey results indicated that providing RDS at the Libraries is still welcome by the CWU researchers. It implied that the Libraries were in the right direction and should move forward. On the other hand, data privacy could be an issue that the Libraries must be aware of when providing RDS services. Meanwhile, the librarians and supporting staff should develop knowledge and skills in research data management services based on Joo and Schmidt's study (2021).

The limitation of the study: the study just examined an individual case at a specific regional-comprehensive university. Therefore, the findings could not represent a pattern for all other regional-comprehensive universities in the USA. However, the methods, survey questionnaire, and phased three-year implementation plan described in the chapter on Recommendations could be adopted by other regional-comprehensive universities planning to develop an RDS program at their home institutions.

Another limitation is the results cannot represent the needs of graduate students. From the perspective of the response rates, the survey questions seemed not well designed for graduate studies. The study recommended a follow-up study to explore and assess graduate students' data needs so the Libraries can provide tailored services for graduate students.

Recommendations:

This study proposed a three-year phased implementation plan for the Libraries. Because the Libraries has a limited budget and resources, this study suggested the Libraries should submit a business case to the University Enterprise Information Systems Committee to seek funding from

the University. Cost estimates included salary and benefit for creating a new research librarian position focusing on data services, purchasing storage for data preservation for the long run, purchasing research data management tools including data management planning tools, GIS & geospatial services tools, data visualization tools, and presentation and graphics tools.

Year one: the Libraries should form a working group and create an RDS model prototype. Integrate current resources such as institutional repositories, open-data resources, research guides, and existing data services so the Libraries can provide a centralized information platform for researchers and students. Create a library faculty position on data services and seek approval from the Provost Office. Build an instruction and consultation model to provide essential data services. Initiate the RDS by selecting one or two academic departments as data service partners. Establish a collaborative relationship with Graduate Studies, Academics Colleges and departments, Multimodal Education Center, University Information Systems, and other campus units to promote RDS.

Year two: the Libraries should consider maturing the RDS model. Fill in the new data librarian position. Extend RDS services to the College of the Sciences. Concentrate on finding resources and datasets for researchers, creating more research guides on the topics such as Research Data Management, Data Management Plan, and funder requirements. Develop some classes and drop-in workshops on data services. Collaborate with other university units for an external grant to enhance RDS service.

Year three: the Libraries will scale up the RDS model to the entire research community and external researchers who collaborated with CWU faculty and students so that the Libraries can provide a full range of data services to a broader scope.

Conclusions

This study analyzed the data needs of researchers in a regional-comprehensive university, discussed the possibility of developing an RDS for the Libraries, and then proposed a phased RDS implementation plan.

Specifically, this study designed a survey to collect information and data from researchers at the university. This study also discussed and explored the possibility of developing an RDS program at the University Libraries. The study found that the researchers' needs in a regional-comprehensive university such as CWU could be quite different from those in a research-intensive university. Therefore, implementing an RDS program in a regional-comprehensive university could be more distinguished than that in a research-intensive university. For example, at the University of California, Berkeley (Wittenberg et al., 2017), the Central Research Information Technologies unit was the primary holder of responsibility for implementing RDS.

Also, the study found that with a limited budget and resources, a regional-comprehensive university library should make an in-depth assessment and evaluation of researchers' needs before launching an RDS program. Additionally, a regional-comprehensive university library should consolidate its current resources and focus on the services derived from the assessment and evaluation process. The students and faculty at a regional-comprehensive university would benefit if the library could offer managed data services. Also, this study will feel rewarded if this article can give those peer libraries some insights and helpful information when planning to launch a new research data service at their home institutions.

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