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REVIEW

Librarians and Research Data Management–A Literature Review: Commentary from a Senior Professional and a New Professional Librarian

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ABSTRACT

In the changing landscape of libraries and the roles of librarians, the area of Research Data Management (RDM) is emerging with new opportunities and challenges. This literature review identifies the current levels of publication that deal with the relationship of the librarian and their role in the research data management process and provides an examination of institutional research policies supporting collaboration of librarians as part of the research team.

KEYWORDS

Librarians; RDM; research cycle; research data management; research data management plan; research data management tools; research management

Introduction

The emergence of the area of Research Data Management (RDM) in the space of Library & Information Services is one that has sparked interest as well as concerns. These concerns are based around the questions of what exactly is RDM and what if any is the role of the library or librarian in its management, engagement, and development.

This joint article is written from the perspectives of a recently qualified librarian and an experienced librarian. From the student perspective, the terms RDM and Research Data Management Plan (DMP) have only emerged from engagement through research and co-authoring with fellow MLIS Capstone team members. A recent course offering by the School of Information & Communication Studies at the University College Dublin, which covered the area of Research Data Management, brought these two authors together to investigate the literature available regarding RDM and DMP's, which is envisaged will serve as a valuable resource for Library and Information Professionals.

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Color versions of one or more of the figures in the article can be found online at www.tandfonline.com/racl.

To understand what the role of the Librarian is, in the Research Data Management Plan, it is important to understand the Research Data Life Cycle. The infographic model created by University of Queensland, illustrated the key components (see Figure 1). The Research Data Lifecycle can be divided into the following steps: collection or creation, processing, analysis, preservations, discovery, and re-use

The *collection or creation phase* starts with the collection of data in the form of materials for any background study and literature review, as well as creation of any required materials. The *processing phase* is how the collected/compiled materials will be read, selected, and reported on. The *analysis phase* will then explain the processes taken, ask questions, and draw conclusions from the data. The *preservation phase* will identify the format, location, and length of time the data will be available. The *discovery phase*

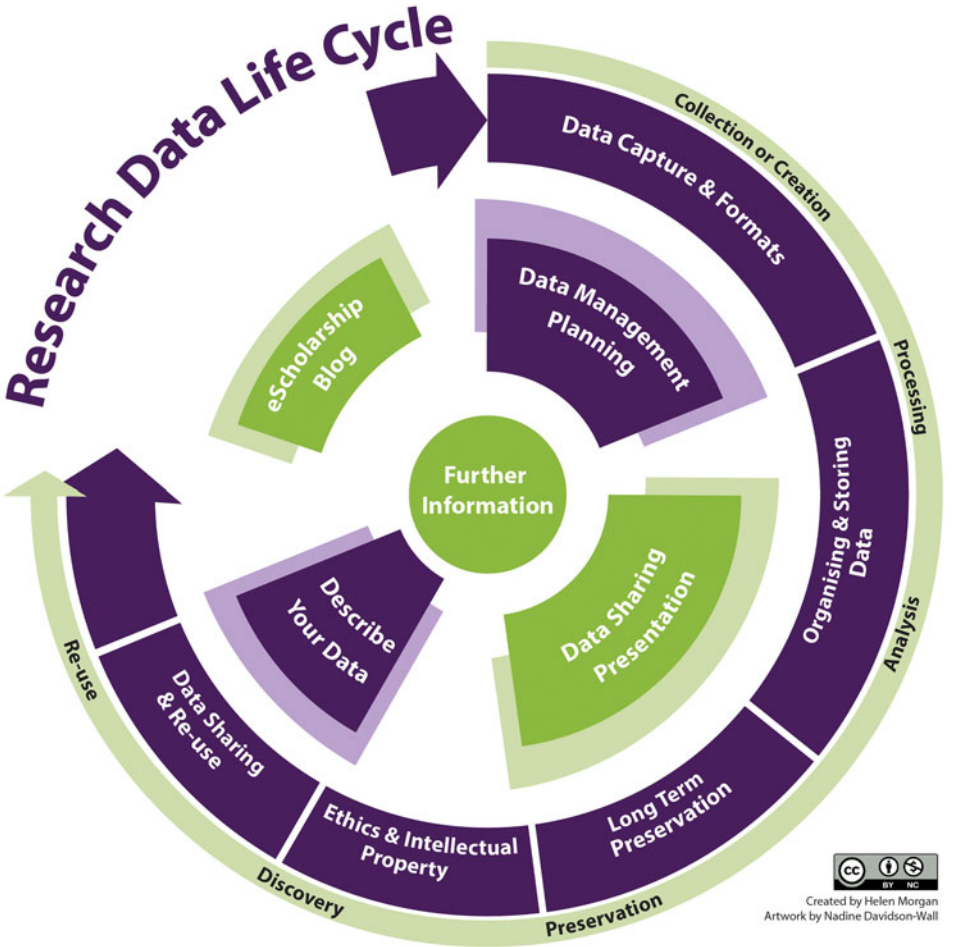

Figure 1. Research Data Lifecycle visual, Created by Helen Morgan and Nadine Davidson-Wall, University of Queensland. Available online: http://libguides.library.cqu.edu.au/researchdatamanagement. This item is listed as Creative Commons.

will outline the availability of the data, who may access it, where, how, and for how long. The *re-use phase* is to ensure that future researchers will have access to any data for their own study.

The Digital Curation Center (DCC) is a site dedicated to providing and supporting good research data practices. The DCC has a comprehensive set of resources for all levels of research. There are a number of briefing papers that can aid in the Data Management planning process from the data life-cycle (Digital Curation Center, 2017a), to tools (Digital Curation Center, 2017b), and roles (Digital Curation Center, 2017c, 2017d). The DCC briefly highlights the fact that some parts of any RDM require more than one individual and often require a large time investment, especially curation, to enhance findability and usability. To aid in the distribution of roles, the DCC has produced a chart delineating tasks (Figure 2).

As Librarians, our role is to collect, catalogue, store, preserve, and allow free access to information. As the digital age grows and gathers information at a faster rate and larger volume than ever before, with no sign of slowing, it falls to Librarians to continue this service as an information professional to provide the best information possible to our patrons, no matter the format. Librarians are a key component in the future of Research Data Management as educators and supports. As Librarians are on the front

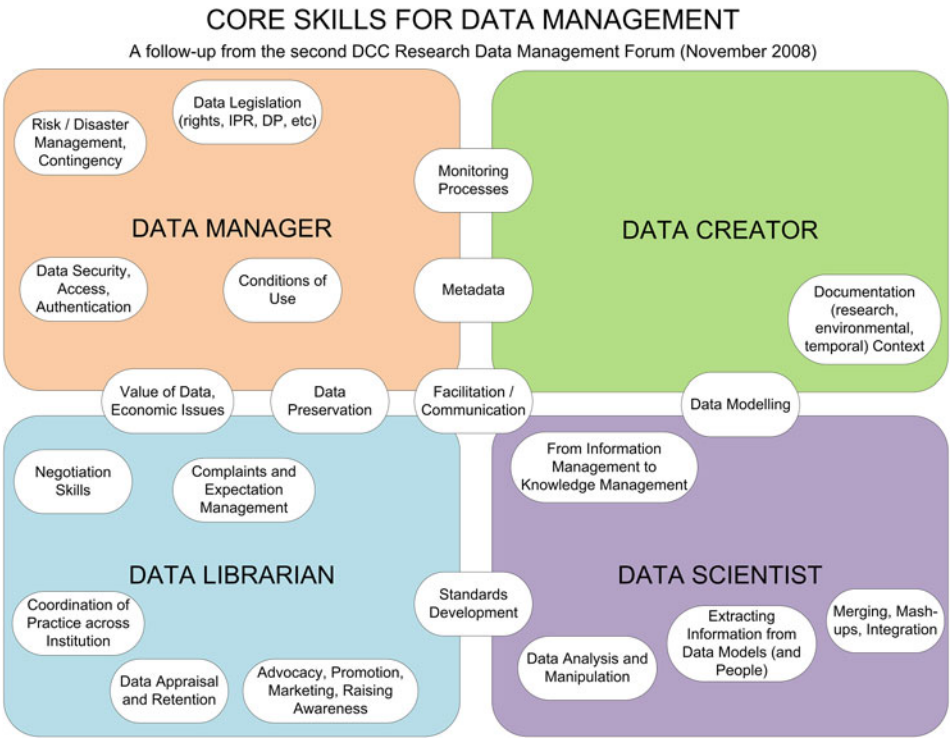

Figure 2. Core Skills for Data Management. C. Rusbridge/M. Donnelly/Research Data Management Forum. Available online: http://www.dcc.ac.uk/resources/roles.

lines of data discovery, re-use, collection, and management in all formats, it only makes sense that they should be involved in the education and support of researchers to understand the best way to conduct research. Students and Academics are continuously researching various topics, but many do not know the proper steps to conduct research and manage the data that they acquire. Involving the Librarian in the RDM planning process allows for a streamlining of data care from the beginning of the research cycle.

There have been mixed opinions on whether or not it is within the role of the librarian to support researchers in the Research Data Management Plan process. While it is becoming a more common view that Research librarians should be involved in the RDM plan, this idea is not known or considered by all researchers, and at one point would rarely have been considered. While issues of involvement and communication between Research Boards and librarians is highly dependent upon the individual governing institutions, more and more libraries are expected to provide information and guidance on a variety of research tools. With the growing visibility of issues surrounding ownership, attribution, data protection, and open source materials, librarians are becoming increasingly involved with the research process and provide relevant research supports.

Increased awareness of research methods and the increased encouragement for librarians to publish will have made many aware of the RDM process, and some librarians will be equipped with enough knowledge to support new researchers with their RDM plan; however, in many cases, the RDM process may be completely new to librarians already working in the field. To support librarians who wish to learn more about the RDM process or provide handy tools for their patrons, a literary review and list of resources will be provided.

Methodology

The present study began with the discussion of what we wanted to determine. Using the approach of a comprehensive literature review, we sought to answer the following questions. First, what is the role of the Librarian in supporting the Research Data Management Planning process? Second what level of support are Librarians expected to give in supporting RDM planning? And, finally, what resources are at the disposal of Librarians to aid in the RDM planning process?

The search for relevant materials began with the highlighting of key phrases: Research Data Management, RDM, Librarians Research Management, Research Cycle, and Research Data Management Tools. Once selected these terms were run through search engines that the general

public would have access to: Google, Twitter, and LinkedIn. The links browsed from Google were those that were from the first two pages of results based on relevance to the term searched, and items looked at from Twitter and LinkedIn were chosen based on being within the first 50 search results and relevance to search term. After the resulting items were chosen it was a matter of reading through them and compiling a list of resource materials, articles, and webpages that discussed RDM planning and training, and the role of libraries and librarians. From these sources, we compiled a Literature review and list of useful resources for librarians.

A comprehensive online search initially used the available tools as previously outlined. The following databases and resources were also investigated. These included: EBSCO, PubMed, Scopus, and Web of Science.

Literature review

While the articles discussed do not specifically discuss the status of RDM policies and the role of librarians, they are still relevant as the content and similarities of roles and education of librarians remains largely the same. As Tenopir et al. (2014) discuss, opportunities in RDM vary at an institutional level and an integration of efforts between librarians and other research support staff would benefit all concerned. In a study by Deards (2013), conducted across four U.S. universities, a comparison was made between Data Management plans, policies, and resources. The websites of each university were tested for relevant information, ease of access, and usability. It was determined that each of the institutions support required improvement and that collaboration between librarians and the research offices would be vital in improvement of their RDM materials, findability, support, and advocacy. Unfortunately, the quickly changing role of librarians has left many unprepared to support researchers in planning their RDM.

Ekstrøm, Elbaek, Erdmann, and Grigorov (2014) discuss the idea that a research librarian is an equal partner in a researcher's quest to find the most relevant information possible. While librarians agreed that their role in aiding students is primary, many look on their role in aiding faculty research as less important. Librarians are seen as data experts that can more easily navigate and present large, complex data sets in an easily understood manner. Again, the ideology that more data science training should be made available to librarians is echoed, such that they may upskill to meet the growing need. It is also stressed that librarians should be consulted in the process of output (publishing); this is expected to grow the trend of Open access for greater academic transparency.

Table 1. Research data management resources.

Articles

Alvaro, E., Brooks, H., Ham, M., Poegel, S., & Rosencrans, S. (2011). E-science librarianship: Field undefined. *Issues in Science and Technology Librarianship*, *66*, 1–16. Retrieved from http://dx.doi.org/10.5062/F46Q1V55

Auckland, M. (2012). Re-skilling for research: An investigation into the role and skills of subject and liaison librarians required to effectively support the evolving information needs of researchers. RLUK: Research Libraries UK. Retrieved from http://www.rluk.ac.uk/content/re-skilling-research/

Cantwell, L., & Van Kampen-Breit, D. (2015). Librarians and the Institutional Review Board (IRB): Relationships matter. *Collaborative Librarianship*, *7* (2), Article 4.

Cox, A., & Pinfield, S. (2013). Research data management and libraries: Current activities and future priorities. *Journal of Librarianship and Information Science*, 46 (4), 299–316. Retrieved from http://dx.doi.org/10.1177/0961000613492542

Cox, A., Pinfield, S., and Smith, J. (2014). Moving a brick building: UK libraries coping with RDM as a "wicked" problem. *Journal of Librarianship and Information Science* 48 (1), 3–17. Retrieved from http://dx.doi.org/10.1177/0961000614533717

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Gabridge, T. (2009). The last mile: Liaison roles in curating science and engineering research data. *Research Library Issues*, *265*, 15–21. Retrieved from http://old.arl.org/bm~doc/rli-265-gabridge.pdf

Harvey, R. (2008). "Appraisal and selection". DCC Briefing Papers: Introduction to curation. Edinburgh: Digital Curation Centre. Handle: 1842/3325. Retrieved from http://www.dcc.ac.uk/resources/briefing-papers/introduction-curation

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Research Councils UK. *Common Principles on Data Policy*. 2011. Retrieved from http://www.rcuk.ac.uk/research/datapolicy/

Tijerina, B. (2016) Teaching teachers digital privacy and data literacy librarians. Retrieved from https://www.imls.gov/news-events/upnext-blog/2016/10/teaching-teachers-digital-privacy-and-data-literacy-librarians

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Whyte, A., & Allard, S. (Eds). 2014. *"How to discover research data management service requirements." DCC how-to guides*. Edinburgh: Digital Curation Centre. Retrieved from http://www.dcc.ac.uk/resources/how-guides

Whyte, A., & Tedds, J. (2011). Making the case for research data management. *DCC Briefing Papers*. Edinburgh: Digital Curation Centre. Retrieved from http://www.dcc.ac.uk/resources/briefing-papers

Books

Corti, L., Van den Eynden, V., Bishop, L., & Woollard, M. (2014). Managing and sharing research data: A guide to good practice. Los Angeles, CA: SAGE.

Lewis, M. J. (2010). Libraries and the management of research data. In S. McKnight, ed., *Envisioning future academic library services* (pp. 145–168). London, UK: Facet Publishing. Retrieved from: http:eprints.whiterose.ac.uk/11171/

Pryor, G. (2012).*Managing research data*. London, UK: Facet Publishing.

Ray, J. M. (2014). *Research data management practical strategies for information professionals*. West Lafayette, IN: Purdue Univ. Press.

Rice, R., & Southall, J. (2016). *The data librarian's handbook*. London, UK: Facet Publishing.

Learning Materials

Digital Curation Centre. (2017). Data management and curation education and training. Retrieved from: http://www.dcc.ac.uk/training/data-management-courses-and-training

Digital Curation Centre. (2017). Data Management Plans- Checklist. Retrieved from http://www.dcc.ac.uk/resources/data-management-plans/checklist

Digital Curation Centre. (2017). How-to Guides & Checklists. Retrieved from www.dcc.ac.uk/resources/how-guides

Digital Curation Centre. (2017). RDM for Librarians. Retrieved from http://www.dcc.ac.uk/training/rdm-librarians

MANTRA: Research Data Management Training. (2017). Retrieved from http://mantra.edina.ac.uk/

Research Data Netherlands. (2016). Essentials 4 Data Support. Retrieved from http://datasupport.researchdata.nl/en/

University College Dublin Library. (2017). Data Management Checklist. Library Guides. Retrieved from http://libguides.ucd.ie/ld.php?content_id=9797218

(*continued*)

Table 1. Continued.

University of Sheffeild (2015). RDMRose Learning Materials. Retrieved from http://rdmrose.group.shef.ac.uk/?page_id=10

Library Guides

Trinity College Dublin, Library. Research Data. Retrieved from http://www.tcd.ie/library/riss/research-data.php

University of California Los Angeles, Library. (2017). Data Management for the Social Sciences. Retrieved from http://guides.library.ucla.edu/c.php?g=180764&p=1185385

University College Dublin LibGuides- Research Data Management, by Jenny O'Neill; http://libguides.ucd.ie/data

University of Leicester. Data Management Support. Retrieved from http://www2.le.ac.uk/services/research-data/rdm/what-is-rdm

University of Queensland, Australia. (2014). Checklist for a Research Data Management Plan. Library Guides. Retrieved from http://guides.library.uq.edu.au/ld.php?content_id =8034754

Other

Digital Curation Centre. (2017). How guides- Develop a Data Plan. Retrieved from http://www.dcc.ac.uk/resources/how-guides/develop-data-plan#Examples

European Commission, Directorate-General for Research and Innovation. (2015). Horizon 2020 Programme: Guidelines on FAIR Data Management in Horizon 2020. Retrieved from http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf

Guy, M. (2013). RDM Training for Librarians. DCC RDM Services case studies. Edinburgh: Digital Curation Centre. Retrieved from http://www.dcc.ac.uk/resources/developing-rdm-services

JISC (2017). Managing research data in your institution. Retrieved from: https://www.jisc.ac.uk/guides/research-data-management

Jones, S. (2011). "*How to develop a data management and sharing plan." DCC how-to guides*. Edinburgh: Digital Curation Centre. Retrieved from http://www.dcc.ac.uk/resources/how-guides

University of Cambridge (2017). Research Data Management. Retrieved from: https://www.data.cam.ac.uk

Cox, Verbaan, and Sen (2014) discuss the topic of educating librarians in the particulars of RDM with the tool, RDMRose, developed by the University of Sheffield Information School, the libraries of the Universities of Sheffield, Leeds, and York, and funded by Jisc. During the initial stages of the curriculum, librarians showed confusion and anxiety surrounding the subject of the institutional policies of RDM and displayed uncertainty on what role they should take in providing RDM support. As the study progressed materials were designed and altered to best support Continued Professional Development (CPD) of librarians for self-directed study. A list of potential roles that librarians could assume in supporting RDM was also compiled to emphasize different ways RDM could be a relevant and practical skill for each librarian. One of the best elements of this article is the resource list that includes a plethora of articles specifically discussing the topic of CPD for librarians and their evolving roles.

The Digital Curation Center (2017a) is another indispensable resource for training in Research Data Management. The DCC not only provides materials, and a three hour introductory course covering Research data and RDM, Data management planning, Data sharing, Skills, and RDM at Northampton, but also includes links to outside online training kits for librarians.

The Online Computer Library Center (OCLC) has written the first of what will be many articles on the topic of RDM. According to Bryant, Lavoie, and Malpas (2017) the study undertaken was to answer the growing interest in "the context, influences and choices higher education institutions face in building or acquiring RDM capacity—in other words, the

infrastructure, services and other resources needed to support emerging data management practices, p 4." The study spans the research of four Universities of high repute in the United States, the United Kingdom, Australia, and the Netherlands.

The article addresses how big data has changed the present and future of research. Because of the scale of data being recorded is so large it is necessary to find a meaningful way to manage it, in order to take meaning from the data. It is becoming increasingly common for researchers to be required to submit an RDM in order to obtain approval for studies and receive funding. This RDM will include information about: life-cycle, use and re-use, access, methodology, stakeholders, among others.

The study found that three distinct categories of service were provided across dozens of Universities in the United States, Australia, and Europe: Education, Expertise, and Curation. RDM capacity acquisition was studied across four universities via desk research and interviews. Institutions need to know the scope, incentive, and sourcing as well as the scaling of the "problem" they wish to solve with a RDM.

Resources

We have compiled a list of materials and websites that outline and aid in the management of Research Data (Table 1).

Conclusions and recommendations

The amount of information becoming available on RDM and the role of Librarians was once quite difficult to find; however, it is becoming increasingly available through not only articles but also practical training resources. This is not to say that the search is straightforward; a large body of the material overlaps with topics and fields such as: research data services, researcher support, repository management, and open access policies. For the information professional starting out on the RDM educational journey, this plethora of information can be overwhelming and distract from learning the basics of RDM and the role of the librarian as part of the research team.

As the need for interdisciplinary communication between librarians and research support staff becomes more evident, more programs are being set in place to support the role of the librarian in the research team. Although many institutions do not have active policies regarding their DMPs, and even fewer have policies incorporating the role of the librarian in the research team, there are an increasing number of institutions around the world creating these policies. While we originally planned to discuss primarily Irish publications and policies, the amount of available information would have been diluted, as most of the research, programs

and policies published come from the United Kingdom, the United States, and Australia.

Our goal was to highlight some of the articles and programs available to information professionals who are interested in RDM support and to provide a comprehensive list of resources to start the educational journey. Table 1 is a list of RDM support materials that will introduce the core concepts of RDM, discuss the librarians' role in the research team, and provide checklists, and learning tools.

A recommendation from this initial research is that further research and investigation be undertaken in a LIS environment with the engagement and development written and reported in case study form. This will provide practical and worked-through examples of the use of resources engaged with realistic experiences of LIS professionals and their role in the development in the area of RDM.

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This article has not been published elsewhere and has not been submitted for publication elsewhere at this time.

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