



Librarian's Perceptions of Research Data Management as a Professional Development Tool: A Norwegian Perspective

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ABSTRACT

The provision of research data management (RDM) services in academic libraries offers new opportunities for librarians to be integrated into the research agenda of their institutions. The purpose of this study was to explore Norwegian academic librarians' awareness of RDM services and their professional leadership roles in RDM services. The study was conducted through a qualitative approach. Data was collected through semi-structured interviews with library directors and library staff in selected Norwegian academic libraries. The study found that many academic librarians in Norway have a high level of awareness of RDM and participating librarians amply demonstrated their desire for more education in this emerging area in academic library services. Furthermore, librarians also demonstrated their awareness of deposit mandates on researchers to share their research data. Finally, the findings suggest that academic librarians in Norway are familiar with the roles they are expected to play in this emerging field. The implication of these findings is that librarians perceive RDM services as one that have the potential to professionalise library service delivery.

Keywords: Academic Libraries, Deposit Mandates, E-Research, Norwegian Libraries, Research Data Management

Introduction

The influx of Information and Communication Technologies (ICT) in research is generating huge volumes of research data as ICT has become a key tool in conducting research. This has ushered academic research into the “fourth paradigm” where research has become “more collaborative, more computational, and more data intensive” (Tenopir, Sandusky, Allard, & Birch, 2014). Some scholars refer to this

phenomenon as e-research or e-science (Henty, 2008a; Cox & Pinfield, 2013; Calhoun, 2014:199). The proliferation of technology-enabled research (or cyberinfrastructure) coupled with data sharing mandates by research funding bodies for researchers has led to the rising need for research data management (RDM) services in academic libraries (Tenopir et al., 2014).

Cognisant of the value of openness in research, some developed countries have data sharing mandates in place for public funding of research. The Research Council of Norway (RCN) has a data sharing mandate that requires researchers to include a data management plan in their research projects in order to qualify for research grants and funding (Research Council of Norway, 2015). In the UK, academic institutions are also prioritizing their RDM needs (Cox & Pinfield, 2014).

Academic libraries and librarians are challenged to develop research data services in tune with the changing research needs of their users (Tenopir et al, 2014). Academic libraries have a track record in providing research support services to researchers and these are in the form of managing, preserving, and providing access to information (Monastersky, 2013). According to the Organisation for Economic Cooperation and Development (OECD), “sharing and open access to publicly funded research data not only helps to maximize the research potential of new digital technologies and networks, but provides greater returns from the public investment in research”. In advanced countries such as the US and Canada, individual academic libraries provide RDM leadership (Association of Research Libraries, 2010).

Even though academic institutions such as universities and research centres are strategically taking measures to support e-research, both at the academic library and individual staff levels, the technical capacity and infrastructure to support RDM activities has been questioned (Pryor, 2012; Whyte and Tedds, 2011). Henty (2008:2) makes a similar claim that institutions with the requisite skills have not been able to assist researchers in this regard. This means that the mandate from research councils will deter researchers from engaging in research since they lack the requisite skills required to write up the data management plan. Consequently, public funds would not be made available for the research.

In spite of researchers' positive attitude towards sharing and archiving of research data, anecdotal evidence in Norway shows that there are also many challenges that researchers encounter in their attempt to comply with the mandate from research council. As reported by Bruhn (2014), "...the main challenge will be ensuring that data can be stored in a secure manner while remaining accessible and not inhibit researcher careers."

Previous studies from DAMVAD outlined factors that inhibit researchers to perform data management work. According to the studies, researchers do not have the technical skills to do the metadata work, which is mostly technical in nature. Moreover, there are no standardized storage infrastructures, time constraints to organize the data and finally no incentives for researchers who have agreed to share their data.

From the foregoing, the focus of this study is to explore Norwegian academic librarians' perspectives of this emerging service and understand how they perceive their central role in providing professional leadership in RDM services (Lynch & Carleton, 2009). The results may inform and enable librarians, academic administrators and educators to develop RDM plans and integrate RDM into academic library services. Despite the fact that the data used in this study is of Norwegian origin, the findings have important implications for practitioners in Ghana and other emerging countries.

The study aims to explore academic librarians' perceptions of their roles and involvement in research data management support services. In this regard, the specific objectives of the study are to understand librarians' awareness of emerging research data mandates; and explore librarians' perceptions of their potential roles in research data management.

Review of related literature

This review involves themes related to librarians' awareness of and roles in RDM and the roles that are already in place to help provide RDM services in academic libraries. Before this, however, a brief survey of RDM terminology shall be presented.

Definitions of research data management

National research councils, researchers, and information professionals are increasingly using the term research data management in most of their discussions, policies and planned projects (Lord & Macdonald, 2003; Cox & Pinfield, 2013). The University of Leicester (2017) defines the concept of RDM as "...the organisation of data, from its entry to the research cycle through to the dissemination and archiving of valuable results". Other scholars also prefer to use related terms such as "data curation, "digital curation", "digital archiving" and "digital preservation". According to Beagrie (2006) the term "research data management" (RDM) is a new concept, and as there have not been any accepted definitions, it is significant to recognise that these terms can be understood differently depending on the academic discipline of the individual person. For Beagrie, the challenge for assigning a suitable term persisted until 2001, when specialists in the field of information science adopted the term "digital curation". The term digital curation was primarily used at a seminar dubbed "Digital Curation: digital archives, libraries and e-science" An explanation to the use of the term "digital curation" "implies not only the preservation and maintenance of a collection or database but some degree of added value and knowledge" (Beagrie, 2006).

Research data mandates and librarians

Open access to research data is gaining a high level of popularity across countries. Norway is not an exception. Globally, research councils and other government agencies increasingly are requiring that researchers who seek for public grants make their data publicly accessible. This phenomenon is also referred to as "deposit mandate"; a set of policies that require researchers to make their published content available in open access repositories (Calhoun, 2014:190).

In Norway, the Research Council of Norway policy on open access to research data is seen as recommendations and best practices in RDM but not mandatory. This may be due to lack of infrastructure and standards to implement (Research Council Norway, 2015). Among other

reasons, Nielsen (2011) claims “the bottleneck of open science is lack of recognition”. He stressed that open access activities has created lots of opportunities in our knowledge society; however, it still lacked the desired implementation. Henty (2008a) supported the claim and further explained that the lack of available policies to ensure the implementation of open access contributes to its lack of recognition.

In spite of the challenges in implementing open access mandates to research data, since its inception in Norway, there have been some activities aimed at creating awareness. The Norwegian Social Science Data Services (NSD), a national archive for research data organise workshops, seminars, and conferences to promote their services. The NSD promotional services aim at national, international research groups, and academic librarians and other interested professionals to encourage the practices of open access to research data. In an effort to give a better reflection of the wide range of their services, the NSD recently changed its name to “The Norwegian Centre for Research Data” (Henrichsen, 2016).

Within the academic community, researchers are increasing their research capacity through technology in their research activities and this has impacted the research terrain (Tamaro & Casarosa, 2014) Manipulating data sets in a more collaborative process, more computative, and more data intensive way characterise the sudden transformation in research. This new approach to research is often coined as the “fourth paradigm” unlike until recently where science researches were involved in conducting experiments, developing theories, among others (Hey, Tansley & Tolle, 2009).

The Association of Research Libraries (ARL) defines e-research as “computationally intensive, large-scale, networked and collaborative forms of research and scholarship across all disciplines, including all of the natural and physical sciences, related applied and technological disciplines, biomedicine, social science and the digital humanities” (ARL, 2013).

Although more researchers see the opportunities in e-research and look to the library to assist, academic librarians, perhaps, also see it as an opportunity to play a part in the new research life cycle (MacColl, 2010). One major challenge in e-research is that researchers lack the

technical skills to manage the massive data they generate (Henty, 2008b). The library community is encouraged to respond to the fourth paradigm. Previous studies over the years have attempted to discuss libraries' involvement in RDM activities. In more general terms, e-research data services are still in its early stage; only few university libraries have been able to roll out some services (Tenopir et al., 2012). This claim is supported by recent studies. Steinhart et al. (2008) conducted a study on the Data Working Group at Cornell University Library. The study found that few university libraries in the US are actively involved in data curation.

There are, however, few success stories of RDM implementation in academic libraries. Macdonald and Martinez (2014) mention a few examples of university libraries' involvement in e-research services that include a “staging repository” research data service developed by DataStar at Cornell University in the US. Similarly, the John Hopkins University's Sheridan Libraries collaborated with faculty members on developing RDM plans. In the University of California Digital Library, librarians have “played an active role during the development of a new tool, the DMPTool that helps researchers create data plans online”. The DMPTool has a repository feature which stores data. In the discovery feature, librarians assist users to find and access data (Schottlaender & McDonald 2007). Australian University libraries have been quick to implement RDM services (Henty, 2008a) notable among them is the Monash University Library, which has initiated several RDM activities.

In conclusion, Pinfield (2005, cited in Calhoun, 2014:191), an early advocate for deposit mandates, assures that deposit mandates of research data will result in the widespread adoption of open access, which will in turn improve the scholarly communication process. He states further that, the end result of these initiatives will be greater impact of published papers and free availability of high quality scholarly content.

Librarians' roles in research data management

O'Brien (2005:68) argued that “libraries may risk fading from existence

if they don't respond effectively to the changing environment. In e-research, it is the primary research data that must often be managed, made accessible and curated". Furthermore, academic libraries play implicit roles in research through librarians' involvement in the provision of access to data; advocacy and support; and managing data collections. These three roles form the nucleus of librarians' roles in RDM.

Librarians' have on-going roles in ensuring access to critical data sets for researchers. Librarians are involved in managing and preserving scholarly resources, creating more digital resources and making these resources accessible to the researcher through methods such as digitization and other digital library initiatives. These are often achieved through collaborations and partnerships with other stakeholders (Henty, 2008c). Librarians have already invested resources to digitize materials and house, preserve and disseminate digital collections of materials in institutional repositories and developed the expertise needed to manage these repositories (ACRL, 2007).

Libraries are seen to be involved in current policy making within institutions, of course recognising that the work should be done in a collaborative manner (Cox & Pinfield, 2013). Gabridge (2009) highlights the importance of subject librarians initiating a direct contact, to understand the needs of researchers, as well as the needs of the institution. This may be forming a major component of the work of the Library. Librarians are experienced not only in navigating complex information environments, but in understanding the architecture of these environments and how they connect to the needs of research communities (Carlson & Garritano 2010).

Previous studies over the years have attempted to discuss libraries involvement in RDM both at the institutional level as well at the national level. Areas where the library can support researchers in their research activities includes: Offering advice on funding sources, embedded or support roles conducting literature reviews or current awareness alerts for research projects or groups, bibliographic software training, advocacy for open access/institutional repository, data analysis advice, advice on copyright issues and advice on archiving of research records (Auckland, 2012; Garritano & Carlson, 2009).

Lewis (2010:2) opined that "...institutional repositories act as a starting point for data curation. Many universities' libraries for a long time have been engaged in it and it is entering the mainstream of academic library work". Later, various authors also proposed different models of libraries involvement in RDM. Paramount among them is the "Lewis pyramid model". Lewis (2010) proposed a pyramid model of nine areas of RDM activity for libraries. At the top of the pyramid is influencing national policy; at the second level, leading on institutional policy, developing local curation capacity and working with LIS schools to identify required skills; and at the third level, developing LIS workforce confidence with data, teaching undergraduate and postgraduate students, and advisory services and data awareness creation among researchers. Corrall (2012) proposed and discussed the range of possible roles of librarians in RDM. According to Corrall, these roles include a data collection development and access management role. Furthermore, Corrall's model describes how academic libraries can collaborate with other departments within an institution, and the extent to which libraries can position themselves to lead institutional policy. Indeed, all the roles could be seen to require a "multi-professional" approach (Tenopir, 2012:302). Furthermore, Lyon (2012) identified a number of opportunities for libraries in RDM and connected the proposed roles of the library to a research lifecycle model in 10 stages. The roles are outlined as follows:

- RDM requirements gathering - through auditing (with academic departments);
- RDM planning - advocacy and guidance to researchers at all levels (with doctoral training centres).
- RDM informatics - technical advice on data formats and metadata; research data citation;
- RDM citation - providing advice on discovery, citation and re-use of datasets;
- RDM training - training to researchers (with doctoral training centres);
- Research data licensing - expert training on legal and ethical aspects of datasets;

- Research data appraisal - guidance on which data to keep;
- Research data storage (with IT services) - training on data storage and infrastructure services
- Research data access - advice on intellectual property rights and restrictions
- Research data impact (with research support offices) - training on impact assessment tools and strategies.

Lyon's (2012) research identified unique roles for libraries in RDM services. However, the precise services that the library would perform will be dependent on the context and needs of each institution. Furthermore, Cox et al. (2014) argued from a wider institutional perspective that the stakeholders involved in RDM roles are complex and though libraries are playing essential roles in RDM work, there is a need for the library as an important stakeholder to examine the roles and relationships with other stakeholders involved in RDM projects.



Figure1: Components of RDM support services
(Data Curation Centre, UK)

Figure 1 portrays the components of RDM support services developed initially by the Digital Curation Centre (DCC). It describes the various “infrastructures” and “services” that universities require to develop to

support research data management (Jones et.al 2013). They further broadly grouped the structures into three categories:

- An overarching governance framework to shape the delivery of services;
- Specific infrastructure and services provided at key points in the data lifecycle;
- Assistance from support staff to aid the uptake and the use of service;

The model is used as a guide for academic libraries who envisage initiating effective data management services. It outlines a “coherent strategy” and suite of services at every stage. Similarly, it addresses all the components to be examined when delivering RDM services, together with a description of the roles and responsibilities of those who may deliver and use them (Hodson & Molloy, 2014).

Methods

The study was a qualitative study which made use of the case study approach. The population of the study consisted of selected Academic Librarians in senior management roles in the various university libraries of higher education in Norway, including Telemark University, Arctic University, The University College of Oslo and the Norwegian Business School. These persons were selected because of their experience and involvement of RDM projects in the various higher education institutions in Norway. Secondly, they have expressed viewpoints on the subject matter and have been to conferences to present papers relating to libraries and RDM processes. Additionally, the first researcher sampled these persons because they had initiated RDM activities in their academic libraries. At the outset of the project the researcher invited 10 individual academic librarians to assist in the data collection. However, only four (4) persons were identified and were found willing to participate in the study.

Qualitative data in the form of semi-structured interviews were conducted with four (4) library directors and library staffs in Norwegian academic libraries. These interviews were conducted in the months of

June to August 2015. The sample for the study was chosen purposively. A variety of document sources were analysed, including annual reports of the European Policy on Research Data Management, RCN published policy document on open research to data management, research data journal articles, and textbooks. All sources were critically examined, taking into account the social, economic, educational, and political relationships that assist in relating to academic libraries roles in RDM in the Norwegian context (Louis et.al, 2011, p.253).

The study used the constant comparative analysis as a method in qualitative analysis. This strategy involves “taking one piece of data and comparing it with all others that may be similar or different in order to develop conceptualizations of the possible relations between various pieces of data” (Pickard, 2013).

Results

Librarians' awareness of research data mandates

Regarding the Research Council of Norway's published policy on Open Access to Research Data and other policies requiring researchers to adhere to a research data management plan, the response to the answers revealed that all the participants had prior knowledge of their roles towards RDM service. One of the respondents commented that:

“I think lots of librarians are aware of this and are working with it but few visible results yet. I am also aware of the research council mandate and the formulation of it. I think is good thing that the research council is launching these guidelines” (ST1).

Two of the participants also stated that the knowledge gained from the published policy have also influenced the services of the libraries.

“The mandate of the research council also affects the Library services since we are service institutions to help researchers to comply with such obligations.” (St1).

“I am very well aware of it, we have started building a repository for research data and it is the Library that does it” (ST2)

Researchers and faculty members were seen as the primary stakeholders

of RDM projects. For the respondents, the libraries exist to assist researchers and therefore libraries ought to participate in providing research data management service.

“I am aware and in an institutional level that the Library is planning to provide research data management services in the next five years to assist researchers” (St4).

Librarians' perceptions of their roles in Research Data Management

The participants were also asked about the kind of roles academic libraries and librarians need to perform in RDM. In many cases, the participants commented that academic libraries' roles in RDM were not something new and therefore majority of the participants indicated that the services and the experiences they had acquired in the traditional library services would be used to take up the new roles in RDM. Examples of their answers suggest that the experience attained from working with the open access projects gives them the edge to perform RDM work. Two views from the respondents were:

“We are building on our long lasting operation in open access to research publications and so we have a lot of competences in dealing with open access infrastructure” (ST4)

“We have tried to build an experience from the services the library has, For example the library renders service, such as institutional repository and open access awareness” (ST2)

When asked whether libraries and librarians have responsibilities in RDM service, all the five respondents indicated that they have a major responsibility. However, two of the participants mentioned a shared responsibility with the IT department.

“It is the Library that does it together with the IT department and also in collaboration with some researchers” (St2)

“We are engaged with the IT staff to involve in our service, to take care of the technical stuff, which is, the installation of the software, and the Hardware”. (ST1).

One of the respondents retorted that the researchers also share the responsibility with the libraries:

“Libraries need to find researchers who need a service, collaborate with the researcher and get started. Try to build an experience from the services the Library have.” (ST3)

Moreover, librarians' active participation in open access projects has equipped them with in-depth skills in the area of institutional repositories. Librarians mentioned the skill gained in this area have prepared them for the management of research data projects.

Librarians tactfully negotiate with faculty on legal issues such as copyright agreements in the management of data. One respondent stated that:

“Open access to publications has given libraries experience with copyright and licensing, management of publishing and handling of embargo periods as well as retrieval and storing of publications in an international context.” (St5)

Discussion

One of the major aims of the study was to find out awareness of research data mandates among academic librarians involved in the study. The findings show that academic librarians involved in the study are well informed of policies regarding open access to research data in Norway. There is common knowledge and understanding on the research data management mandate as required in the Research Council of Norway guidelines. The participants are already engaged and familiar with the Research Council of Norway guidelines since they already play major roles in advocating for open access to research publications at the institutional level. However, their familiarity with the mandate has not yielded many results yet, though a few academic libraries have initiated RDM services in their respective academic institutions. Examples of such initiatives is the “trolling” project at the Arctic University of Norway, a pilot research data project “BIRD” at the Norwegian Business School Library and the Arctic University library's “TORD.”

The study also investigated the perceived roles of librarians in RDM. The results of the study indicate that these roles may be technical or non-technical. However, viewed differently these roles are three-fold:

namely, advocacy and support role; role of providing access to data; and role of managing data collections.

On advocacy and support role, it was obvious that librarians involved in the study had prior extensive experience in promoting open access to research publications through institutional repositories and other open access options. Other related advocacy and support roles they identified include the provision of specialized advisory service on data storage services, documentation, and intellectual property rights. They often promote the use of open source software to optimize resources and ensure sustainability. Finally, as part of their roles in advocacy and support, librarians also promote and engender collaboration in an effort to ensure shared knowledge and expertise on various aspects of RDM.

In respect of the role of providing access to data, the findings show that librarians have some level of expertise in providing access to data collections, just as in their role in the traditional library. Many librarians expressed their experience with institutional repositories, which they had used previously to provide relevant information objects to supports library users. It can therefore be concluded from the statements of the respondents that they perceive the role of providing access to data as a very plausible role that they can play with a high level of comfort.

Lastly on the role of managing data collections, the participating librarians perceive a potential role in managing data collections. This finding came to light as the librarians demonstrated their skills in using discovery tools such as BibSys Oria to enhance data access and sharing. Furthermore, most of the librarians' awareness of what constitutes data storage infrastructures and their purposes, application and description of metadata standards and schemas for efficient storage and retrieval of data sets, as well as other expertise points to the fact that they understand their potential role in managing data collections within the framework of RDM.

Conclusion

The study explored academic librarians' perceptions of their roles and involvement in research data management support services in the Norwegian context. More specifically, the study examined librarians'

awareness of emerging research data mandates; and their perceptions of their potential roles in research data management. The study finds that many of the academic libraries involved in the study are providing a variety of research data management services and the librarians amply demonstrate their willingness to embrace the new service. As pointed out by Tenopir et al. (2014), these services appear to be extensions of traditional activities.

Of a major concern to this study is the level of awareness of the deposit and data sharing mandate by the Norwegian Research Council among librarians. Most of them are aware of the mandate on researchers to share their research data and this awareness is translated into their desire for more education in this emerging area in library services provision. It is plausible to say that without a mandate, librarians will continue to support students and researchers in finding datasets or repositories for their research, preserve research data in institutional or data repositories and help with negotiating copyright clearance for researchers, among many others.

The implication of this study for librarians in Ghana and elsewhere on the African continent is that librarians should begin discussions on how to provide specialised research support for researchers irrespective of whether there is a mandate or not. Among others, there should be deeper cooperation between researchers and librarians in assessing researchers' data needs. Furthermore, regardless of librarians' little awareness of RDM practices, academic libraries in Ghana should rise to the occasion by pursuing its core responsibilities of supporting researchers by initiating RDM services. Finally, academic libraries should set up RDM communities of practice to provide ongoing skills development and education for particularly subject librarians in an effort to develop their expertise and improve their confidence to engage with researchers.

References

- Association of Research Libraries (2006). *To stand the test of time: long-term stewardship of digital data sets in science and Engineering*. A Report to the National Science Foundation from the ARL Workshop on New Collaborative Relationships: The Role of Academic Libraries in the Digital Data Universe, September 26-27, 2006, VA
- Auckland, M. (2012). *Re-skilling for Research*. Retrieved from Research Libraries UK: <http://www.rluk.ac.uk/content/re-skilling-research> (accessed 20 March 2016).
- Beagrie, N., Lavoie, B., & Woollard, M. (2015). Keeping Research Data Safe2. Retrieved from: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=0.1.1.215.1165&rep=rep1&type=pdf> (accessed 6 June 2015).
- Bruhn, S.L. (2014). *Norwegian researchers willing to share research data*. Retrieved from: http://www.forskningradet.no/en/Newsarticle/Norwegian_researchers_willing_to_share_research_data/1253996461347 (accessed 16 April, 2015).
- Calhoun, K. (2014). *Exploring digital libraries: foundations, practice, prospects*. London: Facet Publishing.
- Carlson J.R., & Garritano, J.R. (2010). *E-science, Cyber infrastructure, and the Changing Face of Scholarship: Organizing for New Models of Research Support at the Purdue University Libraries*. Libraries Research Publications. Paper 137. Retrieved from: http://docs.lib.purdue.edu/lib_research/137. (accessed 11 April, 2016).
- Corrall, S. (2012). Roles and responsibilities: Libraries, librarians, and data. In Pryor, G. (ed.) *Managing Research Data*. London: Facet, 105–133.
- Cox, A. M., & Pinfield, S. (2013). Research data management and libraries: Current activities and future priorities. *Journal of Librarianship and Information Science*, 1–18.

Cox, A. M., & Pinfield, S. (2014). Research data management and libraries: Current activities and future priorities. *Journal of Librarianship and Information Science*, 46 (4), 299–316.

DAMVAD Report. (2014). *Sharing and archiving of publicly funded research data report to the Research Council of Norway*. Retrieved from: <http://www.damvad.com/media/97361/satellite.pdf> (accessed 22 February, 2015).

Garritano, & Carlson J.R. (2009). A subject librarian's guide to collaborating on e-Science projects. *Issues in Science and Technology Librarianship*, 57. Retrieved from: http://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=1168&context=lib_research (accessed 20 May 2015).

Gabridge, T. (2009). *The Last Mile: Liaison roles in curating science and engineering research data*. Research Library Issues: A Bimonthly Report from ARL, CNI, and SPARC, no. 265 (August 2009), 1521. Retrieved from: www.arl.org/resources/pubs/rli/archive/rli265.shtml (accessed 22 June, 2015)

Henty, M. (2008a). Developing the capability and skills to support e-Research. *Ariadne* 55.

Henty, M. (2008b). *Dreaming of data: The library's role in supporting e-research and data management*. Australian Library and Information Association biennial conference, Alice Springs, Australia, 2–5 September 2008. Retrieved from: http://apsr.anu.edu.au/presentations/henty_alia_08.pdf (accessed 10 April 2013).

Henrichsen, B. (2016). *New name for NSD: Norwegian Social Science Data Services Changes its name to NSD –Norwegian Centre for Research Data*. Retrieved from: www.nsd.uib.no/nsd/news (accessed 9 April 2015).

Hey, T., & Trefethen, A. (2003). The Data Deluge: An e-Science

Perspective. *Grid Computing - Making the Global Infrastructure a Reality*, 809–824.

Hodson, S., & Molloy, L. (2014). *Current best practice for research data management policies*. Retrieved from: <http://apo.org.au/resource/current-best-practice-research-data-management-policies>. (accessed 5 May 2016).

Jones S, Pryor G, & Whyte A. (2013). *How to develop research data management services - a guide for HEIs. DCC How-to Guides*. Edinburgh: Digital Curation Centre. Retrieved from: <http://www.dcc.ac.uk/resources/how-guides> (accessed 5 March 2016).

Lewis, M. J. (2010). *Libraries and the management of research data*. In *Envisioning Future Academic Library Services* (pp. 1–28). Retrieved from: <http://www.facetpublishing.co.uk/title.php?id=691-6> (accessed 5 March 2016).

Lomheim, I. (2004). *The Quality Reform in Norwegian Higher Education – The Future Role of Academic Libraries*. Retrieved from: <http://ntnu.diva-portal.org/smash/get/diva2:121853/FULLTEXT01> (accessed 10 July 2014).

Lord, P., & Macdonald, A. (2004). *E-science curation report-data curation for e-science in the UK: An audit to establish requirements for future curation and provision*. Prepared for the JISC Committee for the Support of Research (JCSR). Twickenham, UK, The Digital Archiving Consultancy Limited. Retrieved from: http://www.jisc.ac.uk/uploaded_documents/eScienceReportFinal.pdf (accessed 10 July 2014).

Louis C., Manion L, Morrison, K. (2011) *Research methods in education* (7th ed.). New York: Routledge Publishers.

Lynch, C. and Carleton, D. (2009). The impact of digital scholarship on research libraries. *The Journal of Library Administration*, 49(3): 227244.

Lyon, L. (2012). The informatics transform: Re-engineering libraries of the data decade. *International Journal of Digital Curation* 7(1): 126–138.

MacColl, J. (2010). Library roles in university research assessment. *LIBER Quarterly*, 20(2), 152–168. Retrieved from: http://research-repository.st-andrews.ac.uk/bitstream/10023/1677/1/MacColl_2010_LIBERQuarterly20LibraryRoles.pdf (accessed 10 March 2015).

Martinez-Uribe, L., & Macdonald, S. (2009). *A new role for academic librarians: data curation*. Retrieved from: https://www.era.lib.ed.ac.uk/bitstream/1842/3207/6/data_role.doc (accessed 21 May 2015).

Martinez-Uribe, L., & Macdonald, S. (2009). User Engagement in Research Data Curation. In M. Agosti, J. Borbinha, S. Kapidakis, C. Papatheodorou, & G. Tsakonas (Eds.). *Research and Advanced Technology for Digital Libraries* (Vol. 5714, pp. 309–314). Berlin, Heidelberg: Springer Berlin Heidelberg. Retrieved from: <http://www.springerlink.com/content/7mnq13x34717p483> (accessed 21 May 2015).

Monastersky R. (2013). Publishing frontiers: The library reboots. *Nature* 495(7442): 430–432. Retrieved from: <http://web.b.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=1&sid=8d92b68d-fe36-4f91-9f68-178e05cf4110%40sessionmgr110&hid=105> (accessed 20 May 2015)

O'Brien, L. (2005). E-Research: An Imperative for Strengthening Institutional Partnerships. *EDUCAUSE Review*, 40(6), 65.

OECD. (2015). *Principles and Guidelines for Access to Research Data from Public Funding*. <http://www.oecd.org/sti/sci-tech/38500813.pdf> (accessed 22 February 2015).

Pinfield S., Cox, A.M., & Smith J. (2014). Research Data Management and Libraries: Relationships, Activities, Drivers and Influences. *PLoS ONE* 9(12): e114734.

Pryor, G., Jones, S., & Whyte, A. (2014). Delivering Research Data Management Services Fundamentals of good practice Retrieved from: <http://hioa.eblib.com/patron/FullRecord.aspx?p=1680069> (accessed 22 February 2015).

Steinhart G, et al. (2008) *Digital research data curation: Overview of issues, current activities, and opportunities for the Cornell University Library*. Retrieved from: <http://hdl.handle.net/1813/10903> (accessed 18 May 2015).

Tammaro, A. M., & Casarosa, V. (2014). Research Data Management in the Curriculum: An Interdisciplinary Approach. *Procedia Computer Science*, 38, 138–142.

Tenopir, C., Sandusky, R. J., Allard, S., & Birch, B. (2013). Academic librarians and research data services: preparation and attitudes. *IFLA Journal*, 39(1), 70–78.

Tenopir, C., Sandusky, R. J., Allard, S., & Birch, B. (2014). Research data management services in academic research libraries and perceptions of librarians. *Library & Information science Research*, 36(2), 84–90.

The Research Council of Norway. (2015). *Open Access to Research Data: Policy for The Research Council of Norway*. Retrieved from: http://www.forskningradet.no/en/Article/Open_access_to_research_data/1240958527698 (accessed 10 January 2015).

University of Leicester (2017). *What is Research Data Management?* Retrieved from: www2.le.ac.uk (accessed 29 June, 2017).

Whyte, A., & Jonathan, T. (2011). Making the Case for Research Data Management. In *A Digital Curation Centre Briefing Paper* (pp. 1–8). Retrieved from: http://www.dcc.ac.uk/webfm_send/487 (accessed 1 May 2015).