What Makes a Data Librarian?: An Analysis of Job Descriptions and Specifications for Data Librarian

Marian Ramos Eclevia,[1] **John Christopher L.T. Fredeluces,**[2] **Roselle S. Maestro,**[3] **and Carlos L. Eclevia Jr.**[4]

[1]De La Salle University
[2]University of the Philippines Diliman
[3]De La Salle College of St. Benilde
[4]Emerald Publishing

Abstract: This study examines the essential and desirable knowledge, skills, abilities, and experience for data librarians and related positions in academic libraries. It also aims to explore the duties and responsibilities of these positions to define the profession of data librarianship clearly. This paper attempted to address the following research questions: (1) What are the common competencies and duties of data librarians and related positions as stated in job advertisements?; (2) What are the specific duties and tasks related to research data management are being performed by librarians in Philippine academic libraries?; and, (3) Based on the job advertisement data, what are the training needs of data librarians? This study employed content analysis approach to explore the patterns in library hiring trends and recognise the wide range of competencies needed by data librarians. Various online job search sites were used to collect job advertisements for data librarians and other positions related to data management in libraries. Job descriptions and qualifications were examined based on the following characteristics: position titles, degree requirements, expected years of experience, and salary range. The content analysis was performed using NVivo drag and drop coding technique based on the pre-set categories and sub-categories of qualifications, duties and responsibilities adopted from the job analysis frameworks used by previous studies. The findings of this study are quite interesting as it presents an increasing demand for data librarian positions in many libraries abroad. However, data librarian is not an emerging position in selected Philippine academic libraries. Librarians with research data services responsibilities are commonly known as data librarians. Many job announcements require at least three-year work experience in research data management. The results of this study provide useful information for librarians seeking for positions and library managers who wish to hire data librarians as well as for LIS school administrators who desire to produce LIS graduates with the necessary skills to provide data services. It is also unique as Filipino librarians are included in this study to determine if existing librarian positions perform duties and tasks related to research data management and services.
Keywords: data librarian, data services, job advertisements, data management

---

1. Introduction

Big data has been a buzz word in business, higher education, and information technology world as it drives creative innovations in many fields, including Library and Information Science (LIS) (Kiconco, 2018; Zhan & Widén, 2017). Katal, Wazid and, Goudar (2013) claim that it is challenging nowadays to process a large, massive volume of data using the traditional techniques. They assert that big data is not about the size of data. Its properties, such as volume, velocity, variety, variability, value, and complexity, are what makes it "big" (Katal et al., 2013). The reality of modern life is that structured and unstructured data will continuously and rapidly grow at high speed due to massive developments in information and communications technology, widespread adoption and diffusion of digital technologies in workplaces as well as "affordability and applicability of digital devices leading" to increasing interactions of people using these devices (Kiconco, 2018; Zhan & Widén, 2017, p. 2).

Even though there is no general agreement yet on what big data is, literature discussed its impact, challenges and, potential implications in higher education and libraries (Burton & Lyon, 2017; Federer, 2018; Kiconco, 2018; Ogier, Hall, Bailey, & Stovall, 2014; Yu, 2017; Zhan & Widén, 2017). Institutions, agencies and, professional organisations, such as the United Nations and the International Federation of Library Associations and Institutions (IFLA) recognise the potentials of big data as a critical enabler to achieve the Sustainable Development Goals (SDGs), particularly in monitoring its progress as well as harnessing the power of stakeholder engagement towards evidence-based policies and programs (Kiconco, 2018).

The roles and functions of academic libraries have constantly been evolving to cope with emerging technologies and challenges brought about by the advances in data science. Affelt (as cited in Zhan & Widén, 2017, p. 1) observes that "big data is reshaping the patterns libraries have and use for carrying out their duties." Consequently, librarians are taking new roles in acquiring, recording, analysing, curating and accessing data. Hence, they need to learn and embrace new skill sets to assist their patrons to comprehend big data better and guide them in selecting the most appropriate tools to suit their research goals (Hoy, 2014). Primarily, this study examines the essential and desirable knowledge, skills, abilities, and experience for data librarians and related positions in academic libraries. It also aims to explore the duties and responsibilities of these positions to define the profession of data librarianship clearly. Specifically, this paper addresses the following research questions:

1. What are the common competencies and duties of data librarians and related positions as stated in job advertisements?

2. What are the specific duties and tasks related to research data management (RDM) being performed by librarians in Philippine academic libraries?
3. Based on the job advertisement data, what are the training needs of data librarian positions?

2. Literature review

Libraries are recognised to be a vital influence in RDM development as evidenced in the literature (Cox, Kennan, Lyon, & Pinfield, 2017; Kerby, 2017; Kong, 2015; Sesartic & Töwe, 2016; Showers & Stone, 2014; Si, Xing, Zhuang, Hua, & Zhou, 2015; Tenopir, Pollock, Allard, & Hughes, 2016; Tenopir, Sandusky, Allard, & Birch, 2012; Tenopir et al., 2017; Wittenberg & Elings, 2017; Yoon & Schultz, 2017). As such, despite similarities of RDM to managing institutional repositories (Heidorn, 2011), library managers are faced with challenges, such as high funding costs, the nature and extent of their role in RDM, shifting focus towards providing RDM support and developing research data services (RDS) in their libraries, and developing skills among librarians in the provision of such services (Cox et al., 2017; Reznik-Zellen, Adamick, & McGinty, 2012; Yu, 2017). Nevertheless, its advancement as a library service is still evident (Ogier et al., 2014).

Some leading university libraries worldwide are offering RDS, such as research data introduction, data curation and storage, data management reference, resource recommendation and, data management training (Si et al., 2015). Moreover, there are academic libraries worldwide that have a research data policy, internal collaboration, data management training, and data literacy program (Cox et al., 2017). In the United States, while studies revealed that the increase of the availability of RDS among academic libraries have not been significant within the present decade (Tenopir et al., 2015, 2016; Yu, 2017), the scope and level of services have expanded and initiatives and engagement towards RDM have increased (Yu, 2017). Librarians lacking data management skills and the lack of professional development programs to acquire these skills set has been the main concern in the provision of RDS (Cox et al., 2017). Despite the concerns, with these developments, libraries are at the forefront of developing RDS (Yu, 2017).

The growing interest of researchers towards big data and e-research within the past years had been instrumental for driving demand for professionals with data management skills. Rooting from the influence of academic libraries in advancing data management practices, data librarianship was conceptualised and the job position 'data librarian' has emerged (Khan & Du, 2018; Xia & Wang, 2014). The demands on data management call for distinguishing the qualifications and responsibilities of such positions as required by library managers (Chen & Zhang, 2017). The data librarian is one of the four roles that Swan and Brown (2008) have defined for data professionals, along with 'data creator', 'data scientist,' and 'data manager'. They defined data librarian as

"people originating from the library community, trained, and specialising in the curation, preservation and archiving of data" (Swan & Brown, 2008, p. 1). Delegates of the November 2008 Research Data Management Forum, a community of data producers and custodians, identified a set of core skills needed for data management and mapped these skills among the roles defined by Swan and Brown (Pryor & Donnelly, 2009). The result of this mapping is a diagram of the Core Skills for Data Management, which the Data Curation Centre adopted. The diagram features unique and overlapping skills among the roles and later on modified by Ohaji (2016) to overlap 'metadata' to 'data librarian' since metadata is a part of the library domain.

There is a robust body of research analysing job ads in LIS (J. Kim & Angnakoon, 2016). However, as emerging job positions in the field, few studies focusing on the content analyses of job ads on data librarianship and related positions have been conducted. Kim, Warga, and Moen (2012) investigated the required competencies of professionals in the digital curation field. Using NVivo qualitative analysis software, Kim et al. (2012) analysed the contents of 110 job ads gathered from ALA JobLIST, ARL's Job Announcements, LIS Jobs, and Digital Curation Exchange Jobs in the United States and Canada. Findings revealed that among the top required qualifications are (1) ability to work in an information technology intensive environment, (2) familiarity and knowledge of technical, organisational, and procedural standards and specifications area, and (3) project management skills.

Ohaji's (2016) exploratory study on the roles of data librarian among New Zealand research organisations showed that most of the employers (86%) require interpersonal and communication skills for the digital librarian position. Xia and Wang (2014) utilised text analysis and tag clouding techniques in measuring the term occurrence and co-occurrence frequencies in the job responsibilities and qualifications for social science data librarians. The top co-terms in the required qualifications were "communication skills", "statistical packages", "project management", "metadata standards", and "changing environment". They deduced that employers put the same value on non-technical skills and technical skills when evaluating the recruitment of social science data librarians.

Chen and Zhang (2017), on the other hand, assessed the trends in hiring data management professionals and discovered that the required qualifications are "data management", "social sciences", "research data", "higher education", and "information science." The major responsibility of the data manager is to assist the faculty and students in the collection, management, and analysis of research data (Chen & Zhang, 2017). Furthermore, Khan and Du (2018) study show that the majority of the employers listed "instructional support" as a responsibility of the data librarian while "research assistance" is the most mentioned required skill in all the job ads.

3. Methods

This study is qualitative research using content analysis to examine the job descriptions and specifications of librarians in the area of data management. Content analysis of job announcements is widely used in LIS to explore the patterns in library hiring trends and recognise the wide range of competencies needed by today's library workforce (Beile & Adams, 2000; Chen & Zhang, 2017; Gerolimos, Malliari, & Iakovidis, 2015; Kawooya, Veverka, & Lipinski, 2015; Khan & Du, 2018; Lynch & Smith, 2001; Xia & Wang, 2014). However, researchers must also consider some of its practical drawbacks, such as unavailability of unpublished job ads, varying content of published job postings, time-consuming process for extensive data, subjectivity in thematic manual coding, and risk to human error (Harper, 2012; Stan, 2008). To minimise the subjectivity and human error, qualitative data analysis software may be used similar to previous studies (Khan & Du, 2018; J. Kim et al., 2012; Nicholson & Howard, 2018; Xia & Wang, 2014).

Convenience sampling was adopted to collect the readily-available job ads. Applegate (as cited in Kawooya et al., 2015) noted job announcements for new and emerging library positions are mostly available in the electronic listservs, websites, and online magazines. As such, several online sources were used to collect job ads of data librarians and other positions related to data management in libraries, such as Google, indeed.com, ALA JobList, LinkedIn, Jobstreet.com, Glassdoor, IFLA LibJobs, Jooble, ARL job announcements, and Simplyhired.com. The authors of this study used keywords, such as "data librarian", "data services librarian", "data services", "research data", "data manager", "data analyst", "data analytics librarian", and "data management librarian" in searching for job ads and job descriptions.

Job ads were included in this study following these criteria:
- The job posting must be published online from 2013 to 2018 in any job search sites
- The employer must be an academic library, with no geographical location
- The advertisement must contain a full description of the job (e.g. employer, description, duties and responsibilities, required and preferred qualifications, and salary range)
- The ads must be librarian positions with duties and assignments related to RDS

All job ads published from January to March 2019 on each site that met the criteria were downloaded using NCapture. This study was limited to jobs posted in the past six years because many of the job ads from previous years are difficult to retrieve. Job postings with no description and duplicate postings were excluded from this study. This study includes a total of 104 anonymised job ads.

The authors of this study served as coders, wherein the first and second coders conducted the initial content analysis, and then the third coder reviewed the coding. They employed deductive and inductive approaches to the coding of qualitative data. The following procedures were performed to analyse job ads:

1) Examine and record the characteristics of each job advertisement based on the following: position titles, degree requirements, expected years of experience, and salary range.
2) Execute NVivo 'broad-brush' or automatic coding to automatically code the job descriptions and specifications and extract the key recurring themes for analysis.
3) Perform the initial content analysis using NVivo drag and drop coding technique based on the pre-set categories and sub-categories of qualifications, duties and responsibilities, which are adopted from the job analysis framework used by Kim et al. (2011) and Ohaji (2016).
4) Review and check the coded documents for consistency and coherence of the coding. In case of disagreements among coders, they discussed the differences and tried to reach a consensus.
5) Employ word frequency query to analyse a segment of the job advertisement.
6) Organise and present the results in tables and word cloud.

4. Limitations

This paper is limited to six years because many of the job ads from previous years are difficult to retrieve. Only published, publicly available ads for librarian positions in academic libraries with tasks, duties, and responsibilities related to RDM were considered in this paper. Thus, the results of this study must be interpreted within the scope and limitations of data and methods. Note that several job ads in this study were rich and descriptive with the full job description and job specifications. However, some postings have limited information about the job and qualifications. Most of the job announcements were from the United States. Only a few job postings from other countries are available in numerous job search sites. As such, this study cannot generalise that data librarian positions in other countries would have the same job descriptions and job specifications.

5. Results and Discussions
5.1 Characteristics of Job Ads

Data services librarian (16.3) is the most common position title as advertised in the sample job ads, followed by data librarian (6.7%) and RDM librarian (6.7%). Of the 104 job ads, majority of the advertised positions were from the United States (89 ads); Canada (10); the United Kingdom (4); and Singapore (1). Sixty-two (62%) per cent of the job ads stated that an MLS from ALA-accredited program is required. Only 12 universities indicated that a doctoral degree is either required or desired qualification. Thirty-six (36) job ads stated the required or preferred years of experience for a data librarian position. Ten

(10) of which require two years of experience in the library setting. A little more than 20% of the sample job ads specified the annual salary, ranging from $48,000 – $116,220. Other libraries (26.9%) stated that the salary commensurate with the applicant's qualifications and experience. Some academic libraries further identified the personal traits of successful candidates in the job description (see Figure 1).

5.2 Required and Preferred Qualifications
Figures 2 and 3 visualise the top 100 most frequent words appeared in the sample job ads. Notice that words are displayed in varying colours and font sizes to denote their occurrences and importance, which allow the readers to recognise their relative prominence in the job ads instantaneously. As shown in the figures, "data" and "research," as expected are the two most prominent words in required and preferred qualifications. When carefully examined the word distribution in single term analysis, "library," "management," "degree," and "software" are also frequently appearing in both required and preferred qualifications. The frequency of word occurrence is higher in required qualifications than those in preferred qualifications. Moreover, a slight difference in word distribution pattern was observed between required and preferred qualifications.

Similar to Xia and Wang's (2014) study, co-term (or combined words) occurrence was also examined to give more meaning to individual terms. When the word "data" is combined with "management" or "research," as explained by Xia and Wang's (2014), it gives a different meaning and cognitive values. Table 1 and 2 present the top 10 co-terms in required and preferred qualifications. Notice the significant change in the distribution of individual terms and co-terms in job qualifications. Consistent with Xia and Wang's (2014) findings, "communication skills" is heavily cited in required qualifications. Other frequently occurring themes in the co-term analysis are "data management," "advanced degree," "interpersonal skills," and "information science." It implies that library management values the importance of excellent communication skills of data librarians to perform RDM-related duties effectively. Aside from having an MLS degree, many libraries (24% of the sample job ads) indicated that potential applicants might have an advanced degree in social sciences, data science or other related disciplines.
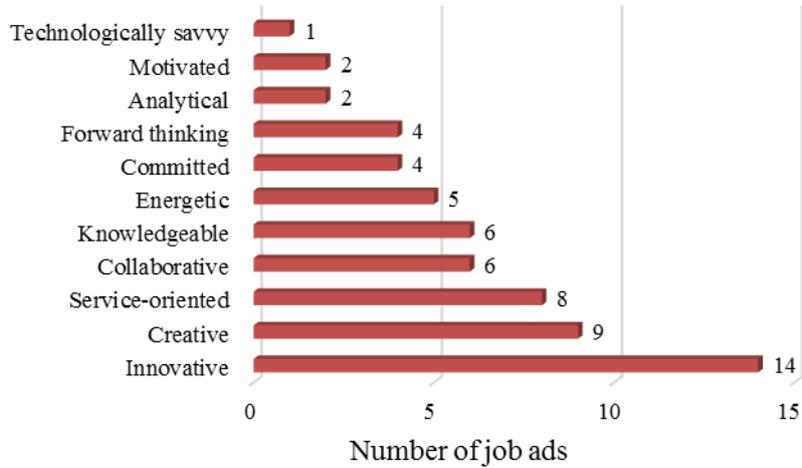
Figure 1 Personal Traits of Data Librarians

Figure 2 Top 100 Most Frequent Terms in Required Qualifications

Figure 3 Top 100 Most Frequent Terms in Preferred Qualifications

Table 1 Top 10 Co-terms in Required Qualifications

Co-Terms	Number of job ads	Number of occurrences
Communication skills	48	48
Data management	39	45
Advanced degree	25	25
Interpersonal skills	20	20

Information science	19	19
Social sciences	10	14
Research data	11	11
Research data management	9	11
Academic library	11	11
Research lifecycle	10	10

Table 2 Top 10 Co-terms in Preferred Qualifications

Co-Terms	Number of job ads	Number of occurrences
Social sciences	12	14
Data management planning	11	13
Academic library	10	10
Data management	9	9
Data visualisation tools	8	8
Professional experience	8	8
Data science	7	8
Data curation	6	6
Research library	6	6
Data retrieval	4	4
Content management systems	4	4
Project management	4	4

When co-term distribution in preferred qualifications was analysed, "social sciences" becomes the most occurring theme (see Table 2). Several academic libraries in this study indicated that applicants with an advanced degree in the social sciences related field are desirable. Potential candidates preferably must have at least work experience in an academic or research library setting. Results also suggests that technical skills, such as data management planning, data visualisation tools, data curation and content management system are more desirable to academic libraries in this study.

Tables 3-6 presents the essential and desired knowledge, skills, abilities and experience for data librarian positions. As explained by Xia and Wang (2014), knowledge "denotes a body of information being memorised or mastered… skills represent learned competencies depending on education, training and improvement with practice…" while "ability signifies one's potentialities in a specified area" (p. 374). The majority of the required and preferred knowledge of new hires are related to the technical aspect of RDM (see Table 3). The successful candidates must have a working knowledge of metadata standards related to the description, access, and preservation of numeric data using Dublin Core, EML, METS, PREMIS, and ISO 19115. They must also demonstrate

knowledge of various qualitative research tools (e.g., NVivo, Atlwas.ti), visualisation tools (e.g., R, Tableau) and spatial analysis tools (e.g., ArcGIS, QGIS, CartoDB). Furthermore, few academic libraries require candidates to have a "knowledge of public and proprietary resources for national and international data sets, data management practices, data policies, sharing and reuse, data citation, and scholarly communication." In terms of subject background and programme area, some libraries specified that candidates must have demonstrated knowledge of emerging trends and best practices in librarianship, and "understanding of issues related to social science research, scholarly publishing and research data."

Ohaji (2016) categorised the required and desired skills for the data librarian role into (1) technical skills including project management, technologies and standards, teaching and instruction, reference, software, data, budget management and computer literacy, and (2) non-technical skills encompassing interpersonal and communication, analytical and problem-solving, flexibility, organisational and planning, presentation, time management, liaison, team and collaboration, professionalism and leadership. When required and preferred skills are examined, the results are consistent with Xia and Wang (2014) and Ohaji (2016), wherein libraries are inclined to focus more on non-technical skills (see Table 4). Almost half of the sample job ads require potential applicants to possess excellent interpersonal and communication skills to collaborate and coordinate with stakeholders and partners, provide reference and research assistance, and manage the development and management of RDS. Conversely, "software and tools" and "technologies and standards" are commonly required and desired technical skills. Some of the commonly mentioned software and tools in job specifications are SPSS, SAS, r, ArcGIS, Tableau, MATLAB, QGIS, ATLAS, ESRI, GIS, NVivo and many more.

Many libraries in this study expect the successful candidates to have the ability to work both independently and collaboratively with others in a team environment (see Table 5). Applicants must be culturally competent to work with a diverse group of faculty, staff, and students in a multicultural academic community. Having strong interpersonal skills, successful candidates are likewise expected to communicate effectively and build good relationships with internal and external departments. Some libraries indicated the required and preferred experience in job specifications. Of which, applicants must have professional engagement and work experience, used software and tools, and engaged in data curation and analysis.

Table 3 Top 10 Most Required and Preferred Knowledge

Knowledge	Required		Preferred	
	Number of job ads	Percent age	Number of job ads	Percent age
Research data curation and management	23	21.5	17	24.6

Software	20	18.7	13	18.8
Technologies and standards	17	15.9	10	14.5
Research and support	12	11.2	4	5.8
Data sources	9	8.4	3	4.3
Data and data lifecycle	8	7.5	6	8.7
Digital repositories	5	4.7	3	4.3
Subject background or programme area	5	4.7	2	2.9
Scholarly communication	4	3.7	7	10.1
Tertiary sector and libraries	2	1.9	1	1.4

Table 4 Top 10 Most Required and Preferred Skills

Skills	Required		Preferred	
	Number of job ads	Percentage	Number of job ads	Percentage
Interpersonal and communication	68	44.4	7	11.1
Software and tools	20	13.1	15	23.8
Technologies and standards	17	11.1	12	19.0
Analytical and problem solving	9	5.9	4	6.3
Cultural competence	9	5.9	3	4.8
Data visualisation	4	2.6	1	1.6
Organisational and planning	4	2.6	5	7.9
Presentation	4	2.6	2	3.2
Project Management	4	2.6	6	9.5
Time management	3	2.0	2	3.2

Table 5 Top 10 Most Required and Preferred Abilities

Ability	Required		Preferred	
	Number of job ads	Percentage	Number of job ads	Percentage
To work independently and collaboratively	50	35.7	17	28.3
To work with a diverse group	17	12.1	4	6.7
To communicate effectively	9	6.4	6	10.0
To build effective relationships	8	5.7	0	0.0
To plan, design and implement projects and services	8	5.7	5	8.3

To use a variety of technology, software and tools	7	5.0	3	5.0
To use and manage data	8	5.7	2	3.3
To provide reference and instruction	5	3.6	4	6.7
To manage multiple and competing priorities	4	2.9	3	5.0
To design and develop online learning objects and assessment	3	2.1	3	5.0

Table 6 Top 10 Most Required and Preferred Experience

Experience	Required		Preferred	
	Number of sources	Percentage	Number of sources	Percentage
Professional engagement and work experience	27	21.3	30	16.5
Software and tools	22	17.3	23	12.6
Data curation and analysis	24	18.9	12	6.6
Research methods and statistics	8	6.3	2	1.1
Collaboration and community engagement	8	6.3	8	4.4
Teaching	7	5.5	12	6.6
Digital repositories	4	3.1	8	4.4
Management and leadership	4	3.1	2	1.1
Project management	4	3.1	7	3.8
Research support, reference and instructional services	4	3.1	15	8.2

5.3 Duties and Responsibilities

Responsibilities enumerated in job descriptions were coded according to people-related, thing-related, and data-related duties. Figures in tables 6-8 show that job descriptions in this study include more people-related duties (443 occurrences) than thing-related duties (251 occurrences). Data-related duties are the least mentioned in job descriptions. The same pattern was also observed by Kim, Addom, and Stanton (2011) and Ohaji (2016). As such, Ohaji (2016) believed that the focus of RDS in libraries are the faculty, students, researchers, and staff. As frequently mentioned in job ads, successful candidates will provide research assistance, collaborate and coordinate with various academic departments, lead the implementation of RDS, and offer support and training on data management. The least identified people-related duties are "communicate with others," and "support report writing."

In the thing-related duties, data librarians have leadership roles in developing and implementing data management services, programmes and tools to ensure that library patrons have access to high-quality data/datasets and excellent RDS. Similar to managing library materials, they are also tasked to select, develop and manage data collections. They will also perform traditional reference and information services, such as chat services, answering questions at the reference desk, and the like. Successful candidates will also be in charge of providing one-on-one consultations and assistance in developing a data management plan, designing and organising data-focused instructions, and delivering in-depth research support for students and faculty.

Table 7 People-related Duties

Duties	Number of job ads	Number of occurrences
Collaborate and coordinate with faculty, students, departments, units and partners	62	81
Provide consultation, advice or support in research	43	54
Lead and manage the development and management of research data services	39	46
Support data management and services to faculty, researchers, and students	32	39
Participate in projects, committees, and external cooperative and professional activities	35	38
Engage in professional development activities	29	30
Serve as a liaison with subject librarians, faculty, and academic departments	27	28
Organise training, workshops, instruction, and events	22	22
Assist faculty, researchers, and students, and or engage in scholarly communications	17	20
Partner or network with other institutions, partners, etc.	15	18
Provide expertise as consultant and resource speaker	15	15
Perform outreach serve as liaison	14	14
Promote RDM services and programs	13	14
Build relationships with faculty, researchers, students, and partners	10	10
Facilitate access to datasets	9	9
Communicate with others	5	5
Support report writing	2	2

In terms of data-related duties, several job ads mentioned responsibilities involving data analysis, data description, data acquisition and data storage (see

Table 8). Fewer duties related to data preservation and data sharing. The results imply that data librarians are more engaged with researchers in the early stages of data management lifecycle.

Table 8 Thing-related Duties

Thing-related Duties	Number of job ads	Number of occurrences
Develop data management services, programmes and tools	53	57
Select, develop and manage collections	34	37
Provide reference and information service	26	28
Manage RDM services	23	24
Maintain and manage technologies	13	19
Create guides, instructional materials, and digital learning objects	15	15
Support technical processes and infrastructure	11	12
Oversee and manage repositories	6	8
Support services and institutional projects	8	8
Administer and implement metadata	7	7
Assist with or engage in scholarly communications	7	7
Work with computers or implement IT for researchers	6	6
Investigate or recommend technology solutions	5	6
Design, deliver, and assess library instruction program	4	5
Document and prepare reports	4	4
Maintain current awareness	3	3
Develop a flexible curriculum on RDM	3	3
Prepare, compile and manage documents	1	1
Manage budgets and project processes	1	1

Table 8 Data-related duties

Duties	Number of job ads	Number of occurrences
Analyse data	37	41
Describe and manage data	35	38
Select and acquire data	34	38
Store data	34	37
Access data	33	33

| Preserve data | 4 | 4 |
| Present or share data | 3 | 3 |

Thirty-two (32) publicly available job ads for librarian positions in Philippine academic libraries were also examined to identify duties and responsibilities related to RDM. The Google search for data librarian positions in the Philippines yielded zero hits. Thus, data librarian position is not an emerging position in selected Philippine academic libraries. Despite the lack of data librarian position, the authors attempted to investigate the duties of librarian position thinking that Filipino librarians might be performing RDM-related tasks. Unfortunately, this study found no relevant results.

5.4 Training and Professional Development
Based on the job ads analysis, the following essential and desirable professional development activities for data librarians:
- participate in relevant conferences and meetings of professional associations and bodies
- actively engage in conversations and forums about data visualisation at the national or international level
- attend training and seminar on quantitative and qualitative data analysis, application of GIS tools in libraries, academic research process, data management services, data visualisation, open data, scholarly communication, data preservation, and technology and practice trends and policy developments
- engage in scholarly research publication

6. Conclusion and Direction for Future Research
The future of the data librarian is promising in academic libraries as they continue to embrace technological innovation, and as researchers increasingly utilise big data. In terms of worker characteristics, libraries in this study value more the technical competencies of data librarians. The sample job descriptions frequently mentioned people-related duties requiring non-technical competencies. It is important to note that many data librarian positions in this study have a leadership role in leading and managing RDS and building effective relationships through collaboration with internal and external stakeholders. Once data librarians are employed, they are not only expected to provide research support to researchers but also actively engage in research projects. Likewise, they are not just teaching researcher on how to properly manage their research data but also to design instructional materials and promote the vital role of libraries in RDM initiatives of academic institutions.

A future study that aims to investigate the actual job performance of data librarians may be conducted to know the discrepancy between job descriptions and role expectations. Researchers may conduct a training needs assessment to ascertain the exact training needs of data librarians. The authors also

recommend investigating the adequacy of the LIS curriculum to determine if LIS graduates are armed with the essential knowledge and skills.

References

Beile, P. M., & Adams, M. M. (2000). Other duties as assigned: emerging trends in the academic library job market. *College & Research Libraries*, *61*(4), 336–347. https://doi.org/10.5860/crl.61.4.336

Burton, M., & Lyon, L. (2017). Data science in libraries. *Bulletin of the Association for Information Science and Technology*, *43*(4), 33–35. https://doi.org/10.1002/bul2.2017.1720430409

Chen, H., & Zhang, Y. (2017). Educating data management professionals: A content analysis of job descriptions. *The Journal of Academic Librarianship*, *43*(1), 18–24. https://doi.org/10.1016/j.acalib.2016.11.002

Cox, A. M., Kennan, M. A., Lyon, L., & Pinfield, S. (2017). Developments in research management in academic libraries: Towards an understanding of research data service maturity. *Journal of the Association for Information Science and Technology*, *68*(9), 2182–2200. https://doi.org/10.1002/asi.2378

Federer, L. (2018). Defining data librarianship: A survey of competencies, skills, and training. *Journal of the Medical Library Association*, *106*(3), 294–303. https://doi.org/dx.doi.org/10.5195/jmla.2018.306

Gerolimos, M., Malliari, A., & Iakovidis, P. (2015). Skills in the market: an analysis of skills and qualifications for American librarians. *Library Review*, *64*(1/2), 21–35. https://doi.org/10.1108/LR-06-2014-0063

Harper, R. (2012). The collection and analysis of job advertisements: A review of research methodology. *Library and Information Research*, *36*(112), 29–54. https://doi.org/10.29173/lirg499

Heidorn, P. B. (2011). The emerging role of libraries in data curation and e-science. *Journal of Library Administration*, *51*(7–8), 662–672. https://doi.org/10.1080/01930826.2011.601269

Hoy, M. B. (2014). Big data: An introduction for librarians. *Medical Reference Services Quarterly*, *33*(3), 320–326. https://doi.org/10.1080/02763869.2014.925709

Katal, A., Wazid, M., & Goudar, R. H. (2013). Big data: Issues, challenges, tools and good practices. In *2013 Sixth International Conference on Contemporary Computing (IC3)* (pp. 404–409). IEEE. https://doi.org/10.1109/IC3.2013.6612229

Kawooya, D., Veverka, A., & Lipinski, T. (2015). The copyright librarian: A study of advertising trends for the period 2006–2013. *The Journal of Academic Librarianship*, *41*(3), 341–349. https://doi.org/10.1016/j.acalib.2015.02.011

Kerby, E. E. (2017). Research data services in veterinary medicine libraries. *Journal of the Medical Library Association*, *104*(4), 305–308. https://doi.org/10.5195/JMLA.2016.146

Khan, H. R., & Du, Y. (2018). What is a data librarian?: A content analysis of job advertisements for data librarians in the United States academic libraries. In *IFLA World Library and Information Congress 2018* (pp. 1–9). Kuala Lumpur. Retrieved from http://library.ifla.org/2255/

Kiconco, C. (2018). Implications of big data on the role of libraries in the realization of sustainable development goals (SDGs). In *Standing Conference of Eastern, Central and Southern African Library and Information Associations* (pp. 634–654). Uganda. Retrieved from https://www.scecsal.org/publications/papers2018/039_kiconco_2018.pdf

Kim, J., & Angnakoon, P. (2016). Research using job advertisements: A methodological assessment. *Library & Information Science Research*, *38*(4), 327–335. https://doi.org/10.1016/j.lisr.2016.11.006

Kim, J., Warga, E., & Moen, W. (2012). Digital curation in the academic library job market. *American Society for Information Science and Technology*, *49*(1), 1–4. https://doi.org/10.1002/meet.14504901283

Kim, Y., Addom, B. K., & Stanton, J. M. (2011). Education for eScience professionals: Integrating data curation and cyberinfrastructure. *The International Journal of Digital Curation*, *6*(1), 125–138. Retrieved from http://www.ijdc.net/article/view/168/236

Kong, N. N. (2015). Exploring best management practices for geospatial data in academic libraries. *Journal of Map & Geography Libraries*, *11*(2), 207–225. https://doi.org/10.1080/15420353.2015.1043170

Lynch, B. P., & Smith, K. R. (2001). The changing nature of work in academic libraries. *College & Research Libraries*, *62*(5), 407–420. https://doi.org/10.5860/crl.62.5.407

Nicholson, J., & Howard, K. (2018). A study of core competencies for supporting roles in engagement and impact assessment in Australia. *Journal of the Australian Library and Information Association*, *67*(2), 131–146. https://doi.org/10.1080/24750158.2018.1473907

Ogier, A., Hall, M., Bailey, A., & Stovall, C. (2014). Data management inside the library: Assessing electronic resources data using the data asset framework methodology. *Journal of Electronic Resources Librarianship*, *26*(2), 101–113. https://doi.org/10.1080/1941126X.2014.910406

Ohaji, I. K. (2016). *Research data management: An exploration of the data librarian role in New Zealand research organizations*. Victoria University of Wellington. Retrieved from http://researcharchive.vuw.ac.nz/handle/10063/5657

Pryor, G., & Donnelly, M. (2009). Skilling up to do data: Whose role, whose responsibility, whose Career? *International Journal of Digital Curation*, *4*(2), 158–170. https://doi.org/10.2218/ijdc.v4i2.105

Reznik-Zellen, R., Adamick, J., & McGinty, S. (2012). Tiers of research data support services. *Journal of EScience Librarianship*, *1*(1), 27–35. https://doi.org/10.7191/jeslib.2012.1002

Sesartic, A., & Töwe, M. (2016). Research data services at ETH-Bibliothek. *IFLA Journal*, *42*(4), 284–291. https://doi.org/10.1177/0340035216674971

Showers, B., & Stone, G. (2014). Safety in numbers: Developing a shared analytics service for academic libraries. *Performance Measurement and Metrics*, *15*(1/2), 13–22. https://doi.org/10.1108/PMM-03-2014-0008

Si, L., Xing, W., Zhuang, X., Hua, X., & Zhou, L. (2015). Investigation and analysis of research data services in university libraries. *The Electronic Library*, *33*(3), 417–449. https://doi.org/10.1108/EL-07-2013-0130

Stan, L. (2008). Content analysis. In A. J. Mills, G. Durepos, & E. Wiebe (Eds.), *The SAGE encyclopedia of qualitative research methods* (pp. 226–230). 2455 Teller Road, Thousand Oaks California 91320 United States: SAGE Publications, Inc. https://doi.org/10.4135/9781412963909

Swan, A., & Brown, S. (2008). The skills, role and career structure of data scientists and curators: An assessment of current practice and future needs. Retrieved April 10, 2019, from http://www.jisc.ac.uk/media/documents/programmes/digitalrepositories/dataskillscareers finalreport.pdf

Tenopir, C., Allard, S., Frame, M., Birch, B., Baird, L., Sandusky, R., … Lundeen, A. (2015). Research data services in academic libraries: Data intensive roles for the future? *Journal of EScience Librarianship*, *4*(2), e1085. https://doi.org/10.7191/jeslib.2015.1085

Tenopir, C., Pollock, D., Allard, S., & Hughes, D. (2016). Research data services in European and North American libraries: Current offerings and plans for the future. In *Proceedings of the Association for Information Science and Technology* (Vol. 53, pp. 1–

6). Copenhagen. https://doi.org/10.1002/pra2.2016.14505301129

Tenopir, C., Sandusky, R. J., Allard, S., & Birch, B. (2012). Academic librarians and research data services: Preparation and attitudes. *IFLA Journal*, *39*(1), 70–78. https://doi.org/10.1177/0340035212473089

Tenopir, C., Talja, S., Horstmann, W., Late, E., Hughes, D., Pollock, D., … Allard, S. (2017). Research data services in European academic research libraries. *LIBER Quarterly*, *27*(1), 23–44. https://doi.org/10.18352/lq.10180

Wittenberg, J., & Elings, M. (2017). Building a research data management service at the University of California, Berkeley: A tale of collaboration. *IFLA Journal*, *43*(1), 89–97. https://doi.org/10.1177/0340035216686982

Xia, J., & Wang, M. (2014). Competencies and responsibilities of social science data librarians : An analysis of job descriptions. *College & Research Libraries*, *75*(3), 362–388. https://doi.org/10.5860/crl13-435

Yoon, A., & Schultz, T. (2017). Research data management services in academic libraries in the US: A content analysis of libraries' websites. *College & Research Libraries*, *78*(7), 920–933. https://doi.org/10.5860/crl.78.7.920

Yu, H. H. (2017). The role of academic libraries in research data service (RDS) provision. *The Electronic Library*, *35*(4), 783–797. https://doi.org/10.1108/EL-10-2016-0233

Zhan, M., & Widén, G. (2017). Understanding big data in librarianship. *Journal of Librarianship and Information Science*, 1–16. https://doi.org/10.1177/0961000617742451