ROLES OF LIBRARIANS AS RESEARCH DATA MANAGERS IN ACADEMIC LIBRARIES

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Abstract

The study investigated the involvement of librarians in Research Data Management using a quantitative approach. The study examined the perception of librarians on their roles as Research Data Managers in academic libraries, the actual RDM roles performed by academic libraries and how academic libraries could promote research data management within higher education institutions in Nigeria. The study used the quantitative approach and adopted the descriptive survey research design. The population consisted of 87 librarians from six academic libraries in South West Nigeria. A complete enumeration sampling technique was adopted for the study. Six academic libraries were chosen based on specific criteria and interventions relevant to the study. The selected academic libraries were Nimbe Adedipe Library, FUNAAB, FUOYE University Library; Albert Ilemobade Library, FUTA; Hezekiah Oluwasanmi Library, OAU, Kenneth Dike Library, UI, and UNILAG Library. 52 academic librarians participated in the study. Descriptive statistical analysis was used for data analysis. Findings revealed that academic librarians were familiar with the term "Research Data Management (RDM)" and its significance in academic libraries. The research findings reveal that the following activities are predominantly performed by the majority of respondents: assisting researchers with data management plans (DMPs) [42 (80.8%), 0.8077], collaborating with IT departments and other campus units [38 (73.1%), 0.7308] and providing data storage solutions and guidance [31 (59.6%), 0.5962]. Moreover, a significant portion of respondents affirm that integrating RDM services into the broader support framework of the academic library enhances the effectiveness of research data, with a mean (SD) value of 4.1154 (0.64637). The study indicates that there is a foundational understanding of Research Data Management (RDM) within Nigerian academic libraries, but significant gaps remain in terms of fully performing the specific roles and responsibilities of Research Data Managers (RDMs).

Keywords: Research data management; academic libraries; data management, data curation; academic librarians; Nigeria

Introduction

The rapid proliferation of research data has necessitated the need to have research data managers in academic libraries. The engagement of academic libraries in research data management resonates with the open access movement on one hand and supports researchers to meet the mandate by funders and publishers on developing data management policies to curate and make available data emanating from their research for reuse (Masinde, Chen, Wambiri and Mumo, 2021). The concept of the open access movement refers to the unrestricted access to scientific research outputs through the Internet, thereby allowing users to search, read download and re-use research data and full text of publications for free (Qutab, 2012). Recent literature suggests that awareness of the relevance of data in the advancement of scientific research and innovation is increasing (Ugochukwu and Phillips, 2024). As the volume and complexity of research data continue to rise, research data management is becoming more and more crucial (Hombali, 2022). Research data management (RDM) refers to all the actions taken to ensure that research data is properly structured, stored, archived, and curated to make it findable and reusable (Tripathi, Shukla and Sonkar, 2017).

Research data management aims to reduce the cost of doing research by making data readily available while limiting its duplication and acting as a way of meeting funder mandates (Masine et.al, 2021) capacity development for librarians, deployment of RDM technologies, and formulation and implementation of RDM policies and services (Cox, Kennan, Lyon, and Pinfield, 2017; Zotoo and Liu, 2019). Rapid growth in the volume and complexity of research data has turned Research Data Management into a key function for academic institutions worldwide. Driving forces for this change have been the increasing importance of data-intensive research, funder mandates for open data, and the global emphasis on open science.

Academic libraries now perform more sophisticated functions, such as research support services, in addition to the acquisition, and organisation of library collections, searching and retrieving information for researchers, and reference services. Such research support services entail research data management; open access; scholarly publishing; research evaluation; and research advisory services (Healy, 2022). Research data refer to the recorded factual information, comprising quantitative and qualitative data, images, and audio

recordings, that underpin scientific research and are broadly acknowledged as crucial for validating research outcomes (OECD, 2007). Examples of research data include experimental data, observational data, textual data, visual data, and digital data, methodologies and workflow, field notebooks, models and algorithms (Payal, Awasthi, and Tripathi, 2019; Kalu, Chidi-Kalu and Mafe, 2021). Researchers experience restricted access to research data that are stored by them in the cloud (Zain, Ahmad, Lackie, Kamarudin and Nordin, 2023). It is worth noting that academic libraries in developed nations like the United States of America, UK, Canada and Australia have more widespread growth of RDM services having adjusted their services, infrastructure and roles to reflect the management of research data (Ishida, 2011; Rice and Haywood, 2011 and Cox, Kennan, Lyon and Pinfield, 2017). However, there persists a research gap concerning the roles of librarians as research data managers in academic libraries**.**

Statement of the Problem

Research Data Management (RDM) has turned out to be an integral aspect of the scholarly research environment propelled by, among other factors, increasing information, complicated modes of data-based research inquiries, and demands to preserve accessibility. Whereas well-resourced nations in the global North have widely implemented RDM-related infrastructure, training, and support services, Nigerian academic libraries are seriously lagging behind. Many lack the technical infrastructure, such as institutional repositories and data storage systems, to effectively manage research data (Kalu, Chidi-Kalu, and Mafe, 2021). In addition, inadequate numbers of specially trained librarians in RDM, combined with an absence of relevant national policies and institutional frameworks, make many researchers dependent upon low-security solutions, such as personal cloud storage services, where research data are not well preserved for long. This negatively affects research efficiency, innovation, and compliance with international standards due to the lack of structured RDM services. Moreover, researchers are mostly unaware of the importance of RDM, while librarians still lack the requisite skills required for RDM services (Maurya and Madhusudhan, 2023). Researchers in Nigeria also face significant barriers in the global open science community, impeding their ability to collaborate seamlessly, share knowledge, and contribute substantively to scientific progress, thereby undermining the country's potential for innovation and discovery. Unless these gaps in the current RDM practices are addressed research data management will remain low in Nigeria. The purpose of the study, therefore, is to examine the

involvement of librarians in selected academic libraries in Nigeria in Research Data Management.

Research Questions

1. What are the perceptions of librarians on their roles as Research Data Managers in academic libraries in Nigeria?
2. What are the actual RDM roles performed by academic libraries in academic libraries in Nigeria?
3. In what ways can academic libraries promote research data management within higher education institutions in Nigeria?

Literature Review

Research data management (RDM) is an essential and trending service in academic libraries. The importance of RDM in supporting open science, data sharing, and reproducibility cannot be stressed enough (Subaveerapandiyan, 2023). Research data management offers numerous advantages, including improving the accessibility and reusability of research data, protecting research integrity, and strengthening the verification of research findings through open access to research data. (Hoeven and Kuiper, 2009; Higman and Pinfield, 2015). RDM began as a new addition to library research support services, and librarians have a part to play in facilitating research data curation and data reuse among researchers. A variety of factors influence the adoption of RDM in universities. These factors include a strong organisational structure and strategic insights (Donner, 2022). The practice of research data management in academic libraries is still poorly practised, indicating that research support services in higher education institutions are yet to gain adequate attention due to lack of active collaboration among stakeholders in the academe (Ashiq, Usmani and Naeem, 2022). These stakeholders are librarians, researchers, IT professionals, legal experts and research office directors (Ngaji, 2024).

In providing direction on the role of libraries in research data management, earlier studies such as Lewis (2010) identified the development of research data management plans; development of data catalogues; active data management; data repository; guidance and RDM training and support. By performing these roles, higher education institutions are better positioned to attain research excellence. Moreover, the expansion of academic libraries' responsibilities to include Research Data Management (RDM) is an extension of the traditional roles of librarians as managers of scholarly knowledge and institutional repositories. Due to the expertise of librarians in information curation

and management, it can then be argued that libraries are well-positioned to provide leadership in the development and implementation of research data management. Recent literature reveals some more promising levels of involvement of academic libraries in RDM to include rendering IT support and research advisory services (Bibi, 2024). In addition to this submission, some scholars note that academic librarians should accept the responsibility of teaching students and lecturers on research data management so as to help gain more visibility as researchers (Flores, Brodeur, Daniels, Nicholls and Turnator 2015; Mosha and Ngulube, 2023).

RDM services offered in academic libraries differ from one library to another depending on readiness in RDM positions, organisational and geographic variations and available RDM infrastructure (Tang and Hu, 2019). According to a survey conducted by Subaveerapandiyan and Ugwulebo (2024) in academic libraries in four East African nations: Malawi, Mozambique, Zambia, and Zimbabwe. According to the study, to provide RDM services effectively, higher education institutions should focus enough on creating and executing clear RDM policies and guidelines. It is also recommended that resources be allocated for RDM infrastructure, tools, and training programs. To effectively provide RDM services, academic libraries are to engage in data procurement; processing; storing; archiving; data cataloguing, data sharing; provision of RDM infrastructure; data repository; training on data archiving; awareness and training; and development of data management plan (DMP) and RDM policies (Pinfield, Cox and Smith, 2014; Paul, 2024). Regarding the development of RDM policies, Njagi, Njoroge and Bituka (2024) note that RDM policies need to adhere to open science standards and legal requirements, including intellectual property rights, data security, and privacy regulations. This indicates that libraries play a significant role in promoting responsible research practices such as transparency and reproducibility among researchers (Schmidt, Chiarelli, Loffreda and Sondervan, 2023).

To begin research data management in academic libraries, it should first be introduced as a comprehensive, institution-wide initiative (Verhaar, Schoots, Sesink and Frederiks, 2017). A study by Joo and Schmidt (2021) examined the perspective of academic librarians in providing RDM services and found that users would value consultative services more than technical help. As a result, participants thought that abilities related to consultancy services, like instructional skills and data management planning, were more crucial. As Badenhorst and Raju (2023) put it, academic librarians must acquire key RDM competencies, such as

data management practices, repository management, data curation, and understanding of funder policies. Dessa and Dani (2024) in a study involving RDM management roles performed in Hungarian Academic Libraries found that the University of Debrecen Library, the University of Szeged Library, and the Corvinus University of Budapest Library, the authors discovered that these libraries offer research data management services to researchers; lecturers and PhD students. The RDM services offered include consultation, training, creating an institution-wide data management policy and strategy, and promoting awareness and support for FAIR data sharing, data reuse, and data.

Chigwada, Kasiroori, and Chiparausha (2017) examined the management of research data at Zimbabwean research institutes. The study found that the majority of the research data were in spreadsheet and text format. There was also research data in the form of graphics, audio, video, databases, structured text formats, and software applications. Research data management was negatively impacted by several factors, including a lack of good practice guidelines, a lack of human resources, outdated technology, unsafe infrastructure, the use of different terminology by researchers and librarians, limited financial resources, a lack of research data management policies, and an absence of support from researchers and institutional authorities. Ojo, Dahunsi and Opele (2024) conducted a study on research data management among librarians in selected libraries in south-west, Nigeria. The study unfurls the knowledge, skills, and training requirements of librarians in RDM in selected libraries in the southwest of Nigeria. The study indicated that librarians in academic libraries in Nigeria require training on data preservation and long-term access and ethical considerations in research data management. The study underscores the necessity of partnership between librarians and researchers; professional development for librarians; and collaboration with international organisations for RDM as part of strategies for improving RDM practices in academic libraries in Nigeria.

For academic librarians to function effectively as research data managers, they must possess expertise in data management practices, including data cleaning, metadata creation, data security and data preservation (Tammaro, Matusiak, Sposito and Casarosa, 2019). To acquire these competencies, academic librarians should engage in continuous professional development, including online courses, webinars, and self-directed learning (Mthembu and Ocholla, 2024). While the thinking on capacity building for academic librarians on RDM is in the right direction, some other authors point out that **r**esearchers first need to be

educated on the benefits of research data management and data sharing (Sheikh, Malik, and Adnan, 2023). Such training programs should address legal policy guiding data sharing, data management and awareness campaigns on the importance of RDM practices in the academic community (Subaveerapandiyan and Ugwulebo, 2024).

Igbinovia, Segun-Adeniran and Okuonghae (2024) argue for a technological revamp in academic libraries for libraries to realise their full potential in the management of research data. Sheikh, Malik and Adnan (2023) point out that before librarians can take on RDM roles, their institutions need to have the right resources and support. This includes things like clear policies, funds, ICT infrastructure and RDM training for librarians to develop the skills they need. Hombali (2022) argues that librarians, because of the training they receive in Library and Information Science (LIS) programs, are already equipped with the fundamental knowledge and abilities needed to manage research data, and they are in a good position to create a research data management program that works for their institutions. This assertion may not be true in all cases. For instance, academic libraries in Malaysia have not included data analysis, data citation, data mining, or data visualisation services in RDM (Amanullah and Abrizah, 2023). Academic libraries could also embrace the use of digital technologies such as Artificial Intelligence, Cloud Computing, and Blockchain (Paul, 2024).

Methodology

This study used the quantitative approach and adopted the descriptive survey research design. This study's use of a quantitative approach and survey research design aligns with previous research on research data management (Yabanet, Abubakar, Abdulrahman and Aliyu, 2024). The survey research design allows for the collection of quantitative data. The population of the study comprised 87 librarians from six academic libraries in South West Nigeria namely Nimbe Adedipe Library, FUNAAB, FUOYE University Library, *Albert Ilemobade Library,* FUTA; UNILAG Library, Kenneth Dike Library, University of Ibadan and Hezekiah Oluwasanmi Library, OAU. The six academic libraries were chosen based on specific criteria and interventions relevant to the study. A complete enumeration sampling technique was used therefore; the sample size is equal to the size of the population. To address and answer the research questions, data were collected using a questionnaire. A questionnaire was administered to the entire study population through Google Forms - a web-based application.

Google Forms is appropriate for data collection in social science research (Bhalerao, 2015). Participation in the study was voluntary. Data collection was for four weeks. At the end of the survey, 52 academic librarians participated in the study, giving a response rate of 60%. Data was analysed using the SPSS version and results were presented using descriptive statistics such as frequency counts, percentages, mean values, and standard deviations.

Results and Discussion

This section begins by presenting the findings about demographic information of study respondents**.**

Table 1: Demographic Profile of Respondents (N=52)

Demographic Characteristics	**Frequency**	**Percentage**
Selected Libraries		
Nimbe Adedipe Library	6	11.5
FUOYE Library	10	19.2
Albert *Ilemobade* Library, FUTA	5	9.6
Hezekiah Oluwasanmi library	7	13.5
Kenneth Dike Library, UI	12	23.1
UNILAG Library	12	23.1
Total	**52**	**100.0**
Gender		
Female	27	51.9
Male	25	48.1
Total	**52**	**100.0**
Age Range		
25 – 35	1	1.9
36 – 46	13	25.0
47- 57	34	65.4
Above 57	4	7.7
Total	**52**	**100.0**
Designation		
Assistant Librarian	9	17.3
Librarian I	7	13.5
Librarian II	10	19.2
Reader Librarian	6	11.5
Senior Librarian	17	32.7

University Librarian	3	5.8
Total	**52**	**100.0**

The study found that a majority of the respondents are from the University of Lagos Library and Kenneth Dike Library, University of Ibadan with (12 or 23.1%) each. Also, more female respondents participated in the study (27 or 51.9%). A higher number of the respondents were in the age of 47–57 (34 or 65.4%). Findings further showed that a majority of the respondents are Senior Librarians 17 (32.7%). The study's results displayed robust consistency across demographic groups, lending credibility to the data and supporting their use in informing the conclusions of this investigation.

Table 2: Perception of Librarians on their roles as Research Data Managers in Academic Libraries (N = 52)

Perception of Librarians on their Roles as Research Data Managers	**Minimum**	**Maximum**	**Mean**	**SD**
I have a clear understanding of the term "Research Data Management (RDM)" and its significance in academic libraries.	2.00	5.00	4.1154	0.67603
My understanding of the primary roles and responsibilities of librarians in the context of Research Data Management (RDM) is very low.	1.00	5.00	3.6538	1.20269
I understand that librarians in academic libraries often provide guidance on data storage solutions and best practices to researchers.	1.00	5.00	4.2115	0.97692
I recognise that librarians play a role in ensuring compliance with data protection and privacy regulations when it comes to research data.	1.00	5.00	4.2308	0.89914
I understand that librarians are responsible for curating and preserving research datasets in academic libraries.	1.00	5.00	4.0769	0.88220
I recognise that librarians promote data sharing and open access to research data as part of their role in academic libraries.	1.00	5.00	4.1154	0.78350
I understand that librarians advocate for Research Data Management (RDM) within the academic community.	2.00	5.00	4.1154	0.67603

The first research question south the opinion of respondents on the general comprehension of the roles of Research Data Managers in academic libraries. In Table 2, findings show that a majority of respondents possessed a clear understanding of the term "Research Data Management (RDM)" and its significance in academic libraries, with a mean (SD) value of 4.1154 (0.67603). It also indicates their depth of understanding regarding these responsibilities is somewhat limited, with a mean (SD) value of 3.6538 (1.20269). Additionally, Research Data Managers are perceived to be offering regular guidance on data storage solutions and best practices to researchers, as reflected by a mean (SD) value of 4.2115 (0.97692). Furthermore, respondents recognise that Research Data Managers play a pivotal role in ensuring compliance with data protection and privacy regulations in research data (mean value = 4.2308, SD value = 0.89914). Moreover, respondents indicated that part of the librarian's responsibility is to curate and preserve research datasets in academic libraries (mean value = 4.0769, SD value = 0.88220), promote data sharing and open access to research data as part of their role in academic libraries (mean value = 4.1154, SD value = 0.78350), and advocate for the importance of Research Data Management (RDM) within the academic community (mean value = 4.1154, SD value = 0.67603).

Table 3: Actual Research Data Management Roles Performed by Academic Librarians (N = 52)

Actual Roles Performed by Academic Librarians	**Frequency**	**Percentage**	**Mean**	**SD**
Assisting researchers with data management plans (DMPs).	42	80.8	0.8077	0.39796
Providing data storage solutions and guidance.	31	59.6	0.5962	0.49545
Ensuring compliance with data protection regulations.	21	40.4	0.4038	0.49545
Organizing data workshops and training sessions.	28	53.8	0.5385	0.50338
Curating and preserving research datasets.	19	36.5	0.3654	0.48624
Promoting data sharing and open access.	28	53.8	0.5385	0.50338

Advocating for the importance of RDM within the academic community.	21	40.4	0.4038	0.49545
Collaborating with IT departments and other campus units.	38	73.1	0.7308	0.44789

As regards the actual research data management roles performed by respondents in their respective academic libraries, as shown in table 3, the following activities were predominantly performed by the majority of respondents in Research Data Management practice: assisting researchers with data management plans (DMPs) [42 (80.8%), 0.8077], collaborating with IT departments and other campus units [38 (73.1%), 0.7308], providing data storage solutions and guidance [31 (59.6%), 0.5962], promoting data sharing and open access [28 (53.8%), 0.5385], and organizing data workshops and training sessions [28 (53.8%), 0.5385]. Nevertheless, based on frequency counts, percentages, and mean values, the subsequent roles and responsibilities are less frequently undertaken by respondents. This is because fewer than half of the respondents indicated that they ensure compliance with data protection regulations [21 (40.4%), 0.4038], advocate for the importance of RDM within the academic community [21 (40.4%), 0.4038], and curate and preserve research datasets [19 (36.5%), 0.3654]. These findings imply a notable disparity between the general understanding of the roles and specific responsibilities of Research Data Managers in academic libraries and the actual tasks performed by respondents in this study.

Table 4: How Academic Libraries could promote research data management within higher education institutions (N=52)

Variables	Minimum	Maximum	Median	Mean	SD
I think that by offering RDM services, libraries can help researchers manage their data better, which leads to better research.	1.00	5.00	4.00	4.1154	0.64637
Collaboration between academic librarians and faculty members on RDM	2.00	5.00	4.00	4.3269	0.67798

could promote data sharing and open access.					
Continuous skills development among academic librarians involved on Research Data Management will effectively enhance service delivery.	2.00	5.00	4.00	4.1346	0.59504
By talking about the importance of RDM, we can help improve how research data is managed and used.	2.00	5.00	4.00	4.1731	0.64841

As regards how academic libraries could promote research data management within higher education institutions, the study found that a significant portion of respondents affirm that integrating RDM services into the broader support framework of an academic library will enhance the effectiveness of research data, with a mean (SD) value of 4.1154 (0.64637) as shown in table 4. Similarly, a majority of respondents indicate that collaboration between academic librarians engaged in RDM and faculty members within an academic institution enhances the quality and visibility of research data, yielding a mean (SD) value of 4.3269 (0.67798). Furthermore, a substantial number of respondents believe that the continuous enhancement of knowledge and skills among academic librarians involved in RDM practice effectively boosts service delivery, with a mean (SD) value of 4.1346 (0.59504). Most respondents also express that advocating for the significance of RDM and its services within the academic community can bolster RDM practice, thereby aiding in the provision of high-quality research data services, as evidenced by a mean (SD) value of 4.1731 (0.64841).

Discussion of Findings

This research sought to understand the roles of librarians as Research Data Managers in Academic Libraries**.** Findings revealed that while there is a general comprehension of the term "Research Data Management" among respondents, there remains a limited understanding of the specific responsibilities of Research Data Managers. This aligns with previous research that highlights a gap in knowledge and training about RDM in various contexts. Many librarians are not fully aware of RDM practices, which could hinder their ability to support

researchers effectively (Oo, Chew, Wong, Gladding and Stenstrom (2022). The mean values reported in the study (mean of 4.1154 for understanding RDM and 3.6538 for understanding specific responsibilities) suggest that while there is awareness, further training and professional development are needed to enhance understanding and operational capacity. In the same vein, the finding resonates with previous research by Chawinga, and Zinn (2022), which identified a knowledge gap among librarians regarding the intricacies of RDM, suggesting the need for targeted training programs. The findings show that RDMs primarily assist researchers with data management plans (DMPs), IT department collaboration, and provision of data storage solutions. These roles are consistent with the literature, which suggests that RDMs act as facilitators between researchers and technology services (Hombal, 2022). Effective RDM requires interdisciplinary collaboration, which is echoed by the study's finding that a significant proportion of respondents collaborate with IT departments. Interestingly, fewer than half of the people surveyed engaged in ensuring compliance with data protection regulations or advocating for the importance of RDM within the academic community. This gap suggests a critical area for development, as compliance with data regulations is increasingly vital in research practices (Pansara, 2023). Pansara notes that RDMs are important in navigating the complexities of data protection laws, which is important for making sure research data is correct and trustworthy.

The study further examined how academic libraries could act as catalysts for promoting a culture of research data management within higher education institutions. The findings indicate that integrating RDM within the library's support framework and fostering collaboration with faculty members significantly improve service delivery. This supports the views of Tenopir et al. (2014), who argue that the integration of RDM into existing library services not only enhances the visibility of these services but also ensures that they meet the evolving needs of researchers. The emphasis on ongoing skill development among academic librarians involved in RDM is a pivotal finding. As the field of RDM evolves with new technologies and best practices, continuous professional development is essential. A report by the Digital Curation Centre (DCC, 2019) and Federer (2018) highlights the necessity for RDM training programs to ensure librarians can adapt to these changes and provide high-quality support to researchers. These research findings imply that there is a need for enhanced training, clear definitions of roles, and stronger advocacy within the academic community regarding RDM. As the field of research data continues to evolve, academic libraries in Nigeria—

and globally—must prioritise the development of their RDM services to effectively support researchers and comply with emerging data regulations.

Conclusion

This article investigated the involvement of librarians in Research Data Management using a quantitative approach. The study examined the perception of librarians on their roles as Research Data Managers in academic libraries, the actual RDM roles performed by academic libraries and how academic libraries could promote research data management within higher education institutions in Nigeria. The findings of this study evidenced the fact that although a foundational understanding of Research Data Management (RDM) exists in Nigerian academic libraries, significant gaps remain in terms of fully comprehending and performing the specific roles and responsibilities of Research Data Managers (RDMs). While there is general awareness of RDM, many librarians lack in-depth knowledge and the skills necessary to effectively support researchers, particularly in areas such as compliance with data protection regulations and advocating for the importance of RDM within academic communities. This disconnect can be attributed to challenges such as inadequate training, institutional support, and a lack of interdisciplinary collaboration. The study also emphasizes the significance of continuous professional training for librarians to remain current with evolving RDM practices.

Recommendations

1. Institutions should provide dedicated RDM training to equip academic librarians with the necessary practical skills to effectively manage research data.
2. University Librarians are to ensure that librarians have access to adequate resources and institutional support to engage fully in RDM practices.
3. Academic libraries should actively promote the importance of RDM to the broader academic community.
4. University Librarians should devote more attention to fostering collaboration on RDM among librarians, IT departments, and faculty.
5. Librarians need to educate lecturers on the values of data sharing, open access and the importance of RDM and its services within the academic community.

References

Alex-Nmecha, J. C., & Onifade, A. B. (2023). Research Data Management Practices: Preparedness and Challenges among Librarians in Nigeria. Ghana Library Journal, 28(2), 75-157.

Al-Jaradat, O. M. (2021). Research data management (RDM) in Jordanian public university libraries: Present status, challenges and future perspectives. The Journal of Academic Librarianship, 47(5), 102378.

Amanullah, S. W., & Abrizah, A. (2023). The landscape of research data management services in Malaysian academic libraries: librarians' practices and roles. The Electronic Library, 41(1), 63-86.

Ansari, G., Mushtaq, M., & Shahid, M. H. (2024). Research Data Repositories: Tools, Services and Challenges in Academic Institutes. *Academic Libraries*, 276.

Ashiq, M., Usmani, M. H., & Naeem, M. (2022). A systematic literature review on research data management practices and services. Global Knowledge, Memory and Communication, 71(8/9), 649-671.

Badenhorst, P., & Raju, J. (2023). Research Data Management Competencies for Academic Libraries: Perspectives from Two Universities in South Africa. African Journal of Library, Archives & Information Science, 33(2).

Bhalerao, A. K. (2015). Application and performance of Google Forms for online data collection and analysis: A case of North Eastern Region of India. *Indian Journal of Extension Education*, *51*(3and4), 49-53.

Bibi, T. (2024). Academic Advancement: Libraries' Integral Support for Research in Public Sector Universities of Khyber Pakhtunkhwa, Pakistan. Journal of Computing & Biomedical Informatics, 7(01), 559-570.

Castle, C. (2019). Getting the central RDM message across: A case study of central versus discipline-specific research data services (RDS) at the University of Cambridge. Libri, 69(2), 105-116.

Chawinga, W. D., & Zinn, S. (2021). Research data management in universities: a comparative study from the perspectives of librarians and management. International Information & Library Review, 53(2), 97-111.

Chigwada, J., Chiparausha, B., & Kasiroori, J. (2017). Research data management in research institutions in Zimbabwe. Data Science Journal, 16, 31-31.

Cox, A. M., Kennan, M. A., Lyon, L., & Pinfield, S. (2017). Developments in research data 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.

Dessa, H., & Dani, E. (2024). An Investigation of Current Research Support Services in Hungarian Academic Libraries. The Canadian Journal of Information and Library Science, 47(2), 39-48.

Digital Curation Centre (DCC). (2024). Training and Skills Development for Research Data Management. Available at https://www.dcc.ac.uk/training

Federer, L. (2018). Defining data librarianship: a survey of competencies, skills, and training. Journal of the Medical Library Association: JMLA, 106(3), 294.

Flores, J. R., Brodeur, J. J., Daniels, M. G., Nicholls, N., & Turnator, E. (2015). Libraries and the research data management landscape. The process of discovery: The CLIR postdoctoral fellowship program and the future of the academy, 2010, 82-102.

Hasan, F. F., & Hameed, S. J. (2022, October). The Perspective of Data Quality Rules In Google Forms. In *2022 International Symposium on Multidisciplinary Studies and Innovative Technologies (ISMSIT)* (pp. 707-710). IEEE.

Healy, S. (2022). Academic Libraries and Research Data Management: A Systematic Review. *Vjesnik bibliotekara Hrvatske*, *65*(3), 171-193.

Higman, R., & Pinfield, S. (2015). Research data management and openness: The role of data sharing in developing institutional policies and

practices. Program: electronic library and information systems, 49(4), 364-381

Hombali, P. (2022). The Role of Librarians in Research Data Management: Challenges and Opportunities. International Journal of Research and Analytical Reviews (IJRAR), 9(1), 359-364.

Hombali, P. (2022). The Role of Librarians in Research Data Management: Challenges and Opportunities. International Journal of Research and Analytical Reviews (IJRAR), 9(1), 359-364.

Igbinovia, M. O., Segun-Adeniran, C. D., & Okuonghae, O. (2024). Research data management in university libraries: The need for data literacy and technological revamp. IFLA Journal, 03400352241280902.

Igbinovia, M. O., Okuonghae, O., & Solanke, O. E. (2023). Research Data Management in University Libraries: Evidence from Nigeria. Rajagiri Journal of Social Development, 15(2), 2-10.

Ishida, M. (2011). Data management in the United States and Canada: academic libraries' contribution. 2012-07-20]. https://circle. ubc. ca/handle/2429/35984.

Joo, S., & Schmidt, G. M. (2021). Research data services from the perspective of academic librarians. Digital Library Perspectives, 37(3), 242-256.

Kalu, C. O., Chidi-Kalu, E. I., & Mafe, T. A. (2021). Research Data Management in an Academic Library. In Handbook of Research on Information and Records Management in the Fourth Industrial Revolution (pp. 38-55). IGI Global

Masinde, J., Chen, J., Wambiri, D., & Mumo, A. (2021). Research librarians' experiences of research data management activities at an academic library in a developing country. Data and Information Management, 5(4), 412-424.

Maurya, A., & Madhusudhan, M. (2023). Research Data Management Services in the Indian Institute of Technology Libraries. Journal of Advancements in Library Sciences, 10(3), 33-40p.

Mosha, N. F., & Ngulube, P. (2023). Teaching research data management courses in higher learning institutions in Tanzania. Library Management, 44(1/2), 166-179.

Mthembu, M. S. (2024). Research Data Management in Higher Education Institutions: Literature Review. Information, Knowledge, and Technology for Teaching and Research in Africa: Data and Knowledge Management, 45-63.

Mthembu, M. S., & Ocholla, D. N. (2024). Research data management competencies of researchers in selected public universities in South Africa. Library Management, 45(3/4), 208-225.

Njagi, P., Gitau, N., & Bituka, R. (2024). Exploring collaborative partnership in research data management: A study of selected university libraries in Kenya. Eastern Africa Journal of Contemporary Research, 4(1), 13-21.

OECD (2007). OECD Principles and Guidelines for Access to Research Data from Public Funding, OECD Publishing, Paris, France

Ojo, A., Dahunsi, F. T., & Opele, J. K. (2024). Data management and curation among librarians in selected libraries in South-West, Nigeria. African Journal of Educational Management, Teaching and Entrepreneurship Studies, 11(2), 194-212.

Oo, C. Z., Chew, A. W., Wong, A. L., Gladding, J., & Stenstrom, C. (2022). Delineating the successful features of research data management training: A systematic review. *International Journal for Academic Development*, *27*(3), 249-264.

Pansara, R. (2023). Navigating data management in the cloud-exploring limitations and opportunities. Transactions on Latest Trends in IoT, 6(6), 57-66.

Payal, S. A., Awasthi, S., & Tripathi, M. (2019). A selective review of literature on research data management in academic libraries. DESIDOC Journal of Library & Information Technology, 39(6), 338-345.

Paul, N. (2024). The Future of Information Science: Exploring the Role of Libraries In Data Management and Digital Curation. Library Progress International, 44(3), 4703-4710.

Perrier, L., Blondal, E., & MacDonald, H. (2018) Exploring the experiences of academic libraries with research data management: A meta-ethnographic analysis of qualitative studies. Library & Information Science Research, 40(3-4), 173-183.

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

Qutab, S. (2012). Open access movement in Pakistan. *Trends in Information Management (TRIM)*, *4*(1), 38-51.

Rice, R., & Haywood, J. (2011). Research Data Management Initiatives at University of Edinburgh. International Journal of Digital Curation, 6(2), 232-244.

Schmidt, B., Chiarelli, A., Loffreda, L., & Sondervan, J. (2023). Emerging Roles and Responsibilities of Libraries in Support of Reproducible Research. Liber Quarterly, 33, 1.

Sheikh, A., Malik, A., & Adnan, R. (2023). Evolution of research data management in academic libraries: A review of the literature. Information Development, 02666669231157405.

Si, L., Zeng, Y., Guo, S., & Zhuang, X. (2019). Investigation and analysis of research support services in academic libraries. The Electronic Library, 37(2), 281-301.

Subaveerapandiyan, A. (2023). Research Data Management Practices ad Challenges in Academic Libraries: A Comprehensive Review. Libr. Philos. Pract.(EJ.), 1-107.

Tammaro, A. M., Matusiak, K. K., Sposito, F. A., & Casarosa, V. (2019). Data curator's roles and responsibilities: An international perspective. Libri, 69(2), 89-104

Tang, R., & Hu, Z. (2019). Providing research data management (RDM) services in libraries: Preparedness, roles, challenges, and training for RDM practice. Data and information management, 3(2), 84-101.

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.

Yabanet, L., Abubakar, T., Abdulrahman, J., & Aliyu, A. (2024). Research Data Management Practices in Sir Kashim Ibrahim Library, Ahmadu Bello University, Zaria. *Lokoja Journal of Information Science Research*, *2*(1), 27-39.

Ugochukwu, A. I., & Phillips, P. W. (2024). Open data ownership and sharing: Challenges and opportunities for application of FAIR principles and a checklist for data managers. Journal of Agriculture and Food Research, 101157.

Verhaar, P., Schoots, F., Sesink, L., & Frederiks, F. (2017). Fostering effective data management practices at Leiden University. Liber Quarterly: the Journal of the Association of European Research Libraries, 27(1), 1-22

Zain, W. M., Ahmad, Z. S., Lackie, P, Kamarudin, N & Nordin, S. K. (2023). Academic Library Opportunity: Examining the Research Data Management Challenges Facing Malaysian Information Science Researchers. International Journal of Information & Knowledge Management (JIKM), 2, 94-106.

Zotoo, I. K., & Liu, G. (2019). Research Data Management (RDM) strategy for academic libraries in Ghana: setting a national development agenda. Open Access Library Journal, 6(4), 1-24.