

# Work in Progress: A Modified Delphi Study of Research Data Governance in Malaysian Research Performing Organizations

Norzelatun Rodhiah Hazmi<sup>1,2</sup>, A.Abrizah<sup>2,3</sup> and A.M.K. Yanti Idaya<sup>2</sup>

<sup>1</sup>Dar al-Hikmah Library, International Islamic University Malaysia  
Kuala Lumpur, MALAYSIA

<sup>2</sup>Department of Library & Information Science, Faculty of Arts & Social Sciences,  
Universiti Malaya, Kuala Lumpur, MALAYSIA

<sup>3</sup>Institute for Advanced Studies,

Universiti Malaya, Kuala Lumpur, MALAYSIA

e-mail: s2038059@siswa.um.edu.my ; abrizah@um.edu.my ; yanti@um.edu.my

## ABSTRACT

*The rapid growth of research data and its influence on research practices has led to an increased recognition of the importance of research data governance (RDG) worldwide. Nevertheless, a dearth of literature exists that explicitly delineates RDG activities undertaken by research performing organizations (RPOs). This study intends to bridge this gap by utilizing a modified Delphi method, which involves a systematic solicitation and collection of feedback from a pool of experts, comprising research data practitioners. This is accomplished through a series of carefully designed sequential surveys, focused specifically on RDG implementation in RPOs in Malaysia. This paper describes an in-progress study to develop consensus among research data practitioners on the importance of organizational roles in RDG task areas at the strategic, tactical, and operational functions. It provides preliminary, partial results for Round 1, regarding RDG task areas carried out by RPOs, based on 26 responses. Statements were rated on a 5-point scale: an interquartile deviation (IQD)  $\leq 0.5$  and a consensus level (CL)  $\geq 85\%$  were considered as consensus. Analysis of the responses revealed a significant consensus among the experts on 14 out of 18 RDG task areas that RPOs should implement. This study has the potential toward the development of an RDG framework covering the governance task areas, activities, and structure based on the consensus achieved. By providing an RDG framework that can be used as a set of best practices, this study can assist RPO leaders in considering implementing RDG and its efforts in their organization.*

**Keywords:** Research Data Governance; Research Data Management; Data Stewardship; Open Science; Delphi Study

## **INTRODUCTION**

Research data governance (RDG) plays a crucial role in organizations' data management strategies, aiming to maximize the value of data while minimizing costs and risks associated with data-related activities (Abraham, Schneider, and vom Brocke, 2019). However, the sensitivity of data governance to different domains and actors within organizations makes it a complex issue to address (Manik et al., 2022; Kabanda et al., 2023; Paparova et al., 2023). In developed countries, RDG has become standard practice, and research institutions typically provide information about data governance, such as data management and sharing policies on their official websites. This ensures proper management of data assets i.e.; providing accessibility to high-value datasets, and promotes transparency and accountability in data-related processes i.e.; enabling validation of research results. However, the situation is different in developing countries, where research on data governance is limited (Manik et al., 2022) and many have not developed strong research governance structures and processes (Juma et al., 2021). Developing countries often face significant disparities in data governance, which can lead to inequalities in access to and use of research data. It is still being determined which research organizations in the developing world that have data governance structures and processes, and there may be a lack of formal policies in place, as data governance is often perceived as unnecessary.

Nevertheless, in the absence of formal policies, researchers in developing countries often engage in informal data governance practices as part of their daily research work. Despite the lack of explicit guidelines, they may adhere to specific principles and procedures to ensure research data's quality, integrity, and security. However, by establishing formalized guidelines and receiving institutional support, the effectiveness and consistency of these practices can be upheld and even enhanced. This study aims to fill the research gap by investigating the extent of RDG implementation in research performing organizations (RPOs) in Malaysia. The study outlines an ongoing effort to achieve consensus among research data practitioners in strategic, tactical, and operational functions regarding the importance of organizational roles in RDG task areas, presenting preliminary results from Round 1 (of 3) of a Delphi study. The ultimate objective is to develop a comprehensive RDG framework through consensus building. The findings of this study are expected to contribute to the establishment of best practices in RDG, enabling leaders of RPOs to consider the implementation of data governance efforts. This framework will serve as a valuable resource, promoting effective research data management, fostering collaboration, and ensuring the reliability and usability of research data.

## **LITERATURE REVIEW**

RDG plays an essential role in producing and sharing scientific knowledge. Effective RDG is crucial for building and enhancing research capacity, and implementing this will contribute to the development of robust data governance frameworks that support high-quality research, promote collaboration and attract funding and partnerships. For successful implementation, organizations need a comprehensive understanding of the entities involved, their responsibilities, and the factors influencing adopting data governance practices. According to

Kouper et al. (2020), RDG encompasses multiple entities contributing to the governance process. These entities are recognized as those responsible for making decisions in governing research data and are vital in fostering research communities that generate scientific knowledge. It is worth noting that researchers often engage in multiple research communities, such as disciplinary, interdisciplinary, and data lifecycle communities. This highlights the importance of interconnectedness and collaboration in effective RDG.

In their study, Merkus et al. (2021) focused on identifying data governance capabilities and designing Data Governance Maturity Models. Their research emphasized the significance of having a validated set of capabilities to ensure effective governance. By utilizing the Generic Capability Reference (GCR) model, they validated the identified capabilities, which serve as a foundation for developing maturity models. Organizations can leverage these capabilities to assess their current data governance status and formulate strategies for improvement. Furthermore, the successful implementation of RDG in organizations is influenced by various organizational factors. Manik et al. (2022) examined the behavior of Indonesian scientists regarding RDG. The findings revealed that increasing scientists' awareness of technology transfer and RDG positively impacts their attitudes and adoption of data governance practices. Hence, organizational strategies should prioritize enhancing awareness and promoting best practices to facilitate the integration of data governance principles into scientists' routines.

Additionally, the implementation of RDG involves collaborative networks and platforms for data sharing. Becker et al. (2022) addressed the challenges of role assignment within health research data sharing networks. Their study emphasized organizations' pivotal role in assigning and clarifying roles to mitigate uncertainties. Organizations can facilitate efficient data sharing by adopting a systematic and principled approach while addressing legal and ethical concerns associated with General Data Protection Regulation (GDPR) and health research. Higman and Pinfield (2015) investigated the development of research data management (RDM) policies and practices in UK Higher Education Institutions (HEIs). They underscored the role of organizations in shaping RDM policies and practices and utilized Actor Network Theory (ANT) to analyze institutional perspectives. Understanding organizations' intricate relationships and dynamics provides valuable insights into the driving forces and challenges of implementing RDG.

In conclusion, the literature review briefly highlights the significance of RDG, emphasizing the need for formalized guidelines for implementation, validated capabilities, enhanced awareness and collaborative networks to ensure effective governance, promote data sharing and suitable research practices.

## **OBJECTIVE AND METHOD**

The objective of this study is to investigate the implementation of RDG task areas and activities within RPOs in Malaysia. Ultimately, the study seeks to create an RDG framework for RPOs. This framework may serve as a comprehensive reference enabling organizations to

establish and evaluate the implementation and practices of RDG. To accomplish this objective, the study formulated the following research question for guiding inquiry: *What research data governance task areas do data practitioners believe are essential for implementation by research performing organizations?* Given the scarcity of information on RDG in Malaysia, the modified Delphi approach is considered appropriate, as suggested by Rowe and Wright (2011). This is because it enables the attainment of consensus among a group of data practitioners regarding RDG practices that hold importance for RPOs, making it a highly suitable method. Anonymity plays a significant role in this approach as it allows professionals to express their thoughts freely without concerns about criticism or bias (Goodman, 1987; Barrett and Heale, 2020). Additionally, it provides a systematic methodology for gathering and synthesizing expert opinions.

Ensuring the validity of the results, the recruitment of suitable experts is crucial in the Delphi study (Rowe and Wright, 2011). Therefore, participants in the study will rely on their various direct knowledge and experiences to reach specific conclusions (Barrett and Heale, 2020). A purposive sampling method was employed to assemble a panel of experts with comprehensive research data experience throughout its lifecycle. The panel consisted of data practitioners, encompassing individuals involved in various aspects of RDM throughout its entire life cycle. This includes researchers, librarians, policymakers, and research officers who actively engage in activities such as data generation, management, and utilization. The general sampling criteria for the Delphi study are as follows: participants should have affiliations with any RPO in Malaysia and demonstrate a willingness to engage and share their valuable experiences actively. Moreover, they should possess practical expertise and knowledge encompassing diverse research data handling and support facets, including data generation, management, and consumption. Additionally, having previous experience or ongoing engagement in the formulation of research data policies for their affiliated institution(s) provided an additional advantage to the participants.

In addition to the general sampling criteria, there exist specific criteria where participants were selected based on their contributions and involvement in the Malaysia Open Science Platform (MOSP)<sup>[1]</sup>, categorizing them based on three levels of governance: strategic, tactical, and operational (Korhonen et al., 2013). Notably, participants at the strategic level included deputy vice-chancellors, directors, deputy directors of research management offices, chief librarians, and Malaysia Open Science Alliances (MOSA) members. Tactical level participants comprised certified data stewards trained under MOSP, while operational level participants comprised those who completed the upskill training program to become **Data Stewards** organized by the Academy of Science Malaysia (ASM), comprising librarians, research officers, information technology officers responsible for institutional/digital repositories, and liaison librarians.

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[1] Malaysian Open Science Platform is an initiative with five research universities for a duration of a three-year (2020-2022) project funded by the Ministry of Science, Technology and Innovation (MOSTI), spearheaded by Malaysia Open Science Alliance and implemented by the Academy of Sciences Malaysia (ASM). See <https://www.akademisains.gov.my/mosp/about/what-is-malaysia-open-science-platform/>

As such, the study divided the participants into three categories: strategic, tactical, and operational by utilizing three sets of questions, i.e.; set A (strategic), set B (tactical), and set C (operational), by aligning them with the participants' positions and tasks within their respective institutions. A total of 109 individuals who met the criteria were invited to participate in the study: 49 for strategic, 15 for tactical, and 45 for operational. At the time of writing this paper, 26 (24%) participants had been recruited for the Delphi study's initial round. The findings were based on the preliminary, partial results for Round 1 regarding RDG task areas carried out by the RPOs, based on 26 responses.

The instrument was written in the English language. Its development drew upon a previous content analysis of policy documents produced by leading RPOs worldwide. The instrument design for this study underwent a rigorous testing phase involving a small group of eight (8) data practitioners from all levels of governance. This pilot testing was conducted to identify issues related to question meaning, wording, structure, and sequence. Additionally, this testing phase helped evaluate the comprehensibility of response categories and determine the average time required for completion (Check and Schutt, 2012). The insights gained from this testing phase were instrumental in refining the instrument. The refined instrument design aims to enhance participant engagement while ensuring the validity and accuracy of their responses (Check and Schutt, 2012). Before proceeding with the pilot testing, the questionnaire underwent a thorough proofreading process to identify any grammatical errors or double-barrelled statements.

The instrument included a personal demographics section and two primary constructs. Part A consisted of generic questions about RDG key players and their roles & responsibilities, while Part B contained more specific statements about RDG task areas for RDG stakeholders. Part A had eight items, while Part B consisted of eleven subsections corresponding to different stakeholders. The stakeholders included the Organization (18 items), Executive Sponsor (2 items), Data Governance Leader (7 items), Research Data Governance Committee (7 items), Office of Research Data Governance (4 items), Research Data Governor (13 items), Research Data Steward (17 items), Administrative Offices (17 items), Research Data Consumer (3 items), and External Bodies (7 items).

Different sets (A, B, and C) had varying stakeholders for Part B, but statements related to the organization were included in all sets. The study collected participants' personal or demographic characteristics such as age, gender, management level, affiliation, position, and research data related roles. The estimated time required to answer all the questions was 45 minutes. Table 1 presents the breakdown of questions across each set.

Table 1. Breakdown of Questions for Each Set

Construct	Set A	Set B	Set C
Part A (RDG key players and their roles & responsibilities)	√	√	√
Part B: The Organization	√	√	√
Part B: Executive Sponsor	√		
Part B: Data Governance Leader	√		
Part B: Research Data Governance Committee	√		
Part B: Office of Research Data Governance	√		
Part B: Research Data Governor		√	
Part B: Research Data Steward		√	
Part B: Administrative Offices			√
Part B: Research Data Consumer			√
Part B: External Bodies			√

Administration of the instrument in this study was conducted electronically, utilizing the secure online form builder Cognito Forms (Cognito, 2023). The panel of experts received a secure link via email, enabling them to complete the questionnaire online conveniently. Each round's questionnaire remained accessible to respondents for approximately two weeks. Participation in the previous round was a prerequisite for panel members to progress to the subsequent rounds, ensuring a cohesive and continuous engagement throughout the study. The analysis relies on descriptive statistics, with the data set to be analyzed using Ms. Excel. Preliminary and partial results for Round 1 are presented, highlighting the RDG task areas undertaken by organizations based on 26 responses. Statements were assessed using a 5-point scale with response options ranging from 1 = Not Important to 5 = Very Highly Important, and a consensus was determined with an interquartile deviation (IQD) of  $\leq 0.5$  and a consensus level (CL) of  $\geq 85\%$ .

## RESULTS

### Demographics

The survey gathered feedback from 26 data practitioners representing diverse age groups, genders, and management levels. The most significant percentage (35%) of participants fell within the 35-39 age category. In terms of gender distribution, the majority of respondents were female, accounting for 81% of the total, while males made up the remaining 19%. Regarding governance levels, two eligible participants responded to two different sets, namely set A and set B. A total of 9 responses from the 7 participants in Set A and 8 responses from the 6 participants in Set B were obtained. Additionally, 11 participants responded to set C. The distribution of participants based on age groups, gender, and governance levels is presented in Table 2.

Table 2. Participants' Age Groups, Gender, and Governance Levels

Item	Description	Frequency	Percentage
Age	35-39	9	35%
	40-44	8	31%
	45-49	5	19%
	50-54	3	12%
	55-59	1	4%
<b>TOTAL</b>		<b>26</b>	<b>101%</b>
Gender	Female	21	81%
	Male	5	19%
<b>TOTAL</b>		<b>26</b>	<b>100%</b>
Governance level	Set A (Strategic)	7	27%
	Set B (Tactical)	6	23%
	Set C (Operational)	11	42%
	Set A and B	2	8%
<b>TOTAL</b>		<b>26</b>	<b>100%</b>

Regarding organizational or RPO affiliation, the majority (88%) were affiliated with public universities. The remaining participants represented research institutions (8%) and ministries (4%) as shown in Table 3.

Table 3: Participants' Organizational Affiliation

Affiliation	Frequency	Percentage
Ministry of Higher Education	1	4%
Public University	23	88%
Research Institution	2	8%
<b>TOTAL</b>	<b>26</b>	<b>100%</b>

Participants were asked to indicate their professional positions within their organizations, and they could choose multiple positions. Most participants (69%) were librarians encompassing various roles and experiences, such as chief librarians, librarians who attended data stewardship training and liaison librarians. Researchers accounted for 15% of the participants; some (12%) were also principal investigators/research leaders and supervisors/mentors, while research officers comprised 12%. Executives represented 8% of the participants, while heads of research comprised 4%. Table 4 indicates the distribution of participants' positions.

Table 4: Participants' Professional Positions

Position	Frequency	Percentage
Executive	2	8%
Head of Research	1	4%
Librarian	18	69%
Principal Investigator/Research Leader, Supervisor/Mentor, etc.	3	12%

Research Officer	3	12%
Researcher	4	15%

In addition to inquiring about the respondents' professional positions, which may imply certain assumptions about their work responsibilities, questions about the specific roles related to research data performed in their work were also asked. These research data-related roles encompassed activities such as accessing, analyzing, and manipulating research data, developing and overseeing research data policies, ensuring legal and regulatory compliance for research data, overseeing overall data and information governance, ensuring the quality and compliance of RDM, actively participating in research activities, monitoring key risk indicators of data misconduct, ensuring data and information governance, and providing support for the implementation of RDM policies.

A significant number of participants had responsibilities that encompassed a wide range of data-related roles, covering almost all aspects. Out of the 26 participants, 54% were involved in supporting the implementation of RDM policies, 38% were engaged in activities such as accessing, analyzing, and manipulating research data, as well as developing and leading research/publication data policies. Additionally, 31% of the participants were actively involved in research activities, 27% were focused on ensuring the quality and compliance of RDM, 23% were responsible for overall data and information governance, and 19% were tasked with ensuring legal and regulatory compliance for research data, as well as maintaining overall data and information governance. One participant (4%) was specifically assigned to monitor key risk indicators for data misconduct. Furthermore, four individual participants added "Other" as their data-related tasks and mentioned activities such as raising awareness about open data on campus, being a member of the RDM team, validating publications and grants, and establishing a unit dedicated to managing RDM and preparing policies. Table 5 presents the breakdown of the distribution of research data-related roles.

Table 5: Participants' Research Data-Related Roles

Role	Frequency	Percentage
Accessing, analyzing, and manipulating research data	10	38%
Developing and overseeing research data policies	10	38%
Ensuring legal and regulatory compliance for research data	5	19%
Overseeing overall data and information governance	6	23%
Ensuring the quality and compliance of RDM	7	27%
Actively participating in research activities	8	31%
Monitoring key risk indicators of data misconduct	1	4%
Ensuring data and information governance	5	19%
Providing support for the implementation of RDM policies	14	54%
Raising awareness about open data on campus	1	4%
Being a member of the RDM team	1	4%
Validating publications and grants	2	8%
Establishing a unit dedicated to managing RDM and preparing policies	1	4%

## Research Data Governance Task Areas

What RDG task areas do data practitioners believe are essential for implementation by research performing organizations? This section addresses this research question based on the findings from Round 1 of the Delphi study. The scale used for rating the task areas ranged from 1 (Not Important) to 5 (Very Highly Important). A consensus rate of 85% and above was considered indicative of agreement among the participants. Overall, the results indicate a high level of consensus among the participants regarding the importance of the RDG task areas assessed in this study. Out of the 18 task areas evaluated, 14 of them achieved a consensus rate of 85% or higher.

Table 6 highlights among the task areas evaluated, most respondents (54% to 58%) agree on the importance of various items by rating them 'very highly important'. These task areas include enabling good RDM, ensuring appropriate use of research materials, investigating unethical practices, providing training on RDM, providing facilities for RDM, protecting the rights of researchers, maintaining RDG policies, and owning research data and intellectual property (IP) created. This belief of 'very highly important' indicates that the respondents recognize the significance of these tasks in facilitating effective RDG. It suggests that there is a shared understanding among the participants regarding the essential of these task areas in promoting ethical practices, preserving data integrity, and safeguarding the rights of researchers.

However, the tasks such as taking custody of research data as necessary and providing long-term stewardship for research data did not achieve a consensus level, with 81% of respondents rating them between 4 to 5. This condition suggests that some participants do not consider these task areas as high priorities in the context of RDG. Furthermore, ensuring research data availability also received relatively lower importance ratings, with only 80% of respondents considering it either 'highly important' or 'very highly important'. The relatively lower prioritization of data availability than other tasks suggests a potential gap in recognizing the significance of making research data accessible and usable for the broader research community. Additionally, recognizing researchers' contributions received the least importance ratings compared to all, with only 76% of respondents considering it either 'very important' or 'very highly important'. While acknowledging and attributing credit to researchers for their contributions is essential for fostering a collaborative and equitable research environment, it appears to be less prioritized than other tasks within RDG.

The importance ratings assigned to various tasks highlights the need for prioritizing tasks that ensure data integrity, compliance, and effective management in research environments. Therefore, these initial findings can inform decision-making processes and resource allocation strategies to enhance RDG practices and implementation.

Table 6: Level of Importance for Research Data Governance Task Areas

Task	1	2	3	4	5	M	IQD	CL
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Ensures research data availability	0%	12%	8%	42%	38%	4	0.5	80%
Supports grant holders' compliance	0%	4%	4%	46%	46%	4	0.5	92%
Maintains metadata catalogue of research data	0%	4%	4%	46%	46%	4	0.5	92%
Protects rights of researchers	0%	4%	12%	27%	58%	5	0.5	85%
Establishes governance committee	0%	8%	8%	35%	50%	4.5	0.5	85%
Maintains research data governance policies	0%	4%	4%	35%	58%	5	0.5	93%
Enables good research data management	0%	4%	4%	38%	54%	5	0.5	92%
Engages with stakeholders	0%	8%	4%	38%	50%	4.5	0.5	88%
Ensures appropriate use of research materials	0%	8%	0%	38%	54%	5	0.5	92%
Investigates unethical practices	0%	8%	8%	31%	54%	5	0.5	85%
Takes custody of research data as necessary	0%	12%	8%	35%	46%	4	0.5	81%
Owns research data and IP created	0%	12%	4%	27%	58%	5	0.5	85%
Develops best practices for research data sharing	0%	12%	4%	35%	50%	4.5	0.5	85%
Provides training on research data management	0%	8%	4%	35%	54%	5	0.5	89%
Provides long-term stewardship for research data	4%	8%	8%	35%	46%	4	0.5	81%
Provides facilities for research data management	4%	8%	4%	31%	54%	5	0.5	85%
Ensures facilities compliant with regulations	0%	8%	8%	35%	50%	4.5	0.5	85%
Recognizes contributions of researchers	4%	8%	12%	38%	38%	4	0.5	76%

Note: 1 - Not Important                      2 - Slightly Important                      3 - Moderately Important  
 4 - Very Important                              5 - Very Highly Important                      M – Median  
 IQD – Interquartile deviation                      CL – Consensus Level  
 \*The shaded items do not reach group consensus

## DISCUSSION AND CONCLUSIONS

The preliminary research findings of the importance ratings assigned to different task areas within RDG, although lacking robustness and reliability, may provide valuable insights into the priorities and areas of focus. Tasks associated with RDG, such as maintaining governance policies and enabling good RDM, were recognized as highly important. This highlights the importance of establishing robust policies and practices that ensure data integrity, accessibility, and compliance with ethical standards (Brous, Janssen, and Vilminko-Heikkinen, 2016; Thompson, Ravindran, and Nicosia, 2015; DAMA International, 2017). Organizations should invest resources and effort into developing and implementing effective governance frameworks that will contribute to enhancing RDM practices (Lefebvre and Spruit, 2021; Marlina and Purwandari, 2019; Wong, Maarop, and Samy, 2020; Abraham, Schneider, and vom Brocke, 2019). Protecting researchers' rights and intellectual property also emerged as significant priorities. Additionally, recognizing the value of researchers' contributions and

ensuring appropriate use of research materials were also rated as highly important tasks. These findings emphasize the need to foster an environment that promotes innovation (Sharif et al., 2018), recognizes researchers' contributions, and upholds ethical practices in research (Nielsen, 2017; Parmiggiani and Grisot, 2020; Hendey, Gold, and Pettit, 2018). Engaging with stakeholders and providing training on RDM were important tasks. These findings highlight the importance of collaboration and capacity building in effective RDM. It is evident that organizations should invest in initiatives that facilitate stakeholder involvement and provide comprehensive training programs to equip researchers with the necessary skills for managing and sharing data effectively (Liu, Zotoo, and Su, 2020; Gunjal and Gaitanou, 2017; Lefebvre, Schermerhorn, and Spruit, 2018).

However, it is evident that ensuring the availability of research data is perceived as less important compared to other tasks. Additionally, taking custody of research data was also rated relatively lower in importance compared to other tasks. Furthermore, providing long-term stewardship for research data and recognizing the contributions of researchers also received low importance ratings. The preliminary nature of these findings emphasizes the need for further validation and verification before drawing definitive conclusions. In the subsequent round, these task areas lacking consensus will be revisited, prompting participants to re-evaluate the importance assigned to them.

In conclusion, understanding the importance ratings of the task areas emphasizes the need for a holistic approach to RDG. Organizations should prioritize tasks related to enabling good RDM, compliance, and ethical practices while considering the specific context and needs of their research environment. Overall, RDG provides the necessary structure and guidelines for responsible and effective RDM, which is foundational to the principles and practices of open science. By integrating RDG into their workflows and addressing these priorities, RPOs can enhance data accessibility, integrity, and collaboration, ultimately contributing to the advancement of scientific knowledge and innovation. The researchers too can ensure that their data is properly managed, shared and utilized in an open and transparent manner.

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#### **REFERENCES**

- Abraham, R., Johannes S., and Jan vom Brocke. 2019. Data governance: a conceptual framework, structured review, and research agenda. *International Journal of Information Management* 49: 424–38. <https://doi.org/10.1016/j.ijinfomgt.2019.07.008>.
- Barrett, D., and Roberta H. 2020. What are Delphi studies? *Evidence Based Nursing* 23 (3): 68–69. <https://doi.org/10.1136/ebnurs-2020-103303>.

- Becker, R., Thorogood, A., Bovenberg, J., Mitchell, C., and Hall, A. 2022. Applying GDPR roles and responsibilities to scientific data sharing. *International Data Privacy Law* 12 (3): 207–19.
- Brous, P., Janssen, M. and Vilminko-Heikkinen, R. 2016. Coordinating decision-making in data management activities: a systematic review of data governance principles. In Scholl, H. J., Glassey, O., Janssen, M., Klievink, B., Lindgren, I., Parycek, P., Tambouris, E., Wimmer, M. A., Janowski, T. and Sá Soares, D. (eds.) *Electronic Government*, 9820:115–25. Lecture Notes in Computer Science. Cham: Springer International Publishing. [https://doi.org/10.1007/978-3-319-44421-5\\_9](https://doi.org/10.1007/978-3-319-44421-5_9).
- Check, J., and Schutt, R. K. 2012. *Research methods in education*. 1st ed. Sage Publications Ltd.
- Cognito. 2023. Cognito forms. 2023. <https://www.cognitofrms.com/product>.
- DAMA International. 2017. The DAMA guide to the Data Management Body of Knowledge (DMBOK2). DAMA International.
- Goodman, C. M. 1987. The Delphi technique: a critique. *Journal of Advanced Nursing* 12 (6): 729–34. <https://doi.org/10.1111/j.1365-2648.1987.tb01376.x>.
- Gunjal, B., and Gaitanou, P. 2017. Research data management: a proposed framework to boost research in higher educational institutes. *IASSIST Quarterly* 41 (1–4): 1–13. <https://doi.org/10.29173/iq12>.
- Hendey, L., Gold, A., and Pettit, K. L. S. 2018. NNIP’s resource guide to data governance and security. National Neighborhood Indicators Partnership.
- Higman, R., and 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): 364–81. <https://doi.org/10.1108/PROG-01-2015-0005>.
- Juma, P. A., Jones, C. M., Mijumbi-Deve, R., Wenham, C., Masupe, T., Sobngwi-Tambekou, J., Biemba, G., Mtombo, N., and Parkhurst, J. 2021. Governance of health research in four Eastern and Southern African countries. *Health Research Policy and Systems* 19 (1): 132. <https://doi.org/10.1186/s12961-021-00781-3>.
- Kabanda, S. M., Cengiz, N., Rajaratnam, K., Watson, B. W., Brown, Q., Esterhuizen, T. M., and Moodley, K. 2023. Data sharing and data governance in Sub-Saharan Africa: perspectives from researchers and scientists engaged in data-intensive research. *South African Journal of Science* 119 (5/6). <https://doi.org/10.17159/sajs.2023/15129>.
- Korhonen, J. J., Melleri, I., Hiekkanen, K., and Helenius, M. 2013. Designing data governance structure: an organizational perspective. *GSTF Journal on Computing* 2 (4): 11–17.
- Kouper, I., Raymond, A. H., and Giroux, S. 2020. An exploratory study of research data governance in the U.S. *Open Information Science* 4: 122–42. <https://doi.org/10.1515/opis-2020-0010>.
- Lefebvre, A., Schermerhorn, E., and Spruit, M. 2018. How research data management can contribute to efficient and reliable science. 26th European Conference on Information Systems (ECIS2018). Portsmouth, UK.
- Lefebvre, A., and Spruit, M. 2021. Laboratory forensics for open science readiness: an investigative approach to research data management. *Information Systems Frontiers*, 381–399. <https://doi.org/10.1007/s10796-021-10165-1>.

- Liu, G., Zotoo, I. K., and Wencheng, S. 2020. Research data management policies in USA, UK and Australia universities: an online survey. *Malaysian Journal of Library & Information Science* 25 (2): 21–42.
- Manik, L.P., Akbar, Z., Yaman, A., and Indrawati, A. 2022. Indonesian scientists' behavior relative to research data governance in preventing wmd-applicable technology transfer. *Publications* 10 (4).
- Marlina, E., and Purwandari, B. 2019. Strategy for research data management services in Indonesia. *Procedia Computer Science* 161: 788–96. <https://doi.org/10.1016/j.procs.2019.11.184>.
- Merkus, J., Helms, R., and Kusters, R. 2021. Data governance capabilities: maturity model design with Generic Capabilities Reference Model. In Proceedings of the 13th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management (IC3K 2021).
- Nielsen, O. B. 2017. A comprehensive review of data governance literature. *Selected Papers of the IRIS*, no. 8: 120–33.
- Paparova, D., Aanestad, M., Vassilakopoulou, P., and Bahun, M. K. 2023. Data governance spaces: the case of a national digital service for personal health data. *Information and Organization* 33 (1): 1–18. <https://doi.org/10.1016/j.infoandorg.2023.100451>.
- Parmiggiani, E., and Grisot, M. 2020. Data curation as governance practice. *Scandinavian Journal of Information Systems* 32 (1): 3–38.
- Rowe, G., and Wright, G. 2011. The Delphi technique: past, present, and future prospects — introduction to the special issue. *Technological Forecasting and Social Change* 78 (November): 1487–90. <https://doi.org/10.1016/j.techfore.2011.09.002>.
- Sharif, N., Ritter, W., Davidson, R. L., and Edmunds, S. C. 2018. An open science 'state of the art' for Hong Kong: making open research data available to support Hong Kong Innovation policy. *Journal of Contemporary Eastern Asia* 17 (2): 200–221. <https://doi.org/10.17477/JCEA.2018.17.2.200>.
- Thompson, N., Ravindran, R., and Nicosia, S. 2015. Government data does not mean data governance: lessons learned from a public sector application audit. *Government Information Quarterly* 32 (3): 316–22. <https://doi.org/10.1016/j.giq.2015.05.001>.
- Wong, Doris Hooi-Ten, Maarop, N., and Samy, G. N. 2020. Data governance and data stewardship: a success procedure. In *2020 8th International Conference on Information Technology and Multimedia (ICIMU)*, 54–61. Selangor, Malaysia: IEEE. <https://doi.org/10.1109/ICIMU49871.2020.924357>