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Fostering professional growth in academic librarians: A SoTL-based lens for Research Data Management capacity building

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ABSTRACT
This study examines the use of the Scholarship of Teaching and Learning (SoTL) as a framework for capacity building in Research Data Management (RDM) among academic librarians. It explores how SoTL principles are applied through interventions such as librarian-led training sessions to develop RDM skills, while presenting best practices and addressing professional growth challenges. A qualitative approach was used, involving interviews with 15 purposively sampled librarians from research-intensive universities in Malaysia actively engaged in RDM services. Key findings show that librarians develop their expertise through four key approaches: acquiring RDM competency; utilizing professional connections; building research partnerships, and initiating RDM services. Additionally, the study reveals that librarians engage in capacity building through SoTL and peer teaching by actively participating in knowledge-sharing practices, both formally and informally, within and outside their institutions. SoTL proved beneficial in fostering a continuous learning cycle as librarians taught their peers. This study concludes that SoTL can reshape professional development among academic librarians.

Keywords: Research data management (RDM); Scholarship of teaching and learning (SoTL); Capacity building; Peer-led training; Academic librarians.

INTRODUCTION

The growing importance of Research Data Management (RDM) in academia, driven by the rise of open science and expanding data-sharing mandates has introduced new responsibilities for academic libraries. Academic libraries now play a crucial role in ensuring research data is FAIR - findable, accessible, interoperable, and reusable. As universities embrace data-centric research, librarians are increasingly tasked with providing essential RDM services across the data lifecycle (Ashiq & Warraich, 2023; Cox et al., 2017; Ismail et al., 2021; Si et al., 2019; Zhang & Eichmann-Kalwara, 2019). This includes supporting researchers' data needs, managing vast datasets, ensuring long-term accessibility, ensuring compliance with data policies and ethical standards, as well as fostering a culture of transparency and accessibility in research (Al-Jaradat, 2021; Antell et al., 2014; Auckland, 2012; Howie & Kara, 2020; Mushi et al., 2020; Rod, 2023; Tang & Hu, 2019). As data-intensive research becomes the norm, academic libraries are prioritizing RDM as a core

service, creating new challenges for libraries to establish policy frameworks (Al-Jaradat, 2021; Yu, 2017), build capacity (Cox et al., 2017; Joo & Schmidt, 2021; Peters, 2017) and develop necessary infrastructure (Aydinoglu et al., 2017; Chigwada et al., 2017). This shift underscores the need for scalable training models that enhance individual expertise and foster institutional knowledge-sharing (Perrier et al., 2018; Rod, 2023; Shipman & Tang, 2019). Consequently, librarians must acquire specialised RDM skills, making capacity building crucial for both their professional growth and the success of their institutions.

In Malaysia, the Malaysia Open Science Platform (MOSP) addresses the need for RDM skills by training librarians in data stewardship, with a strong focus on capacity building and promoting open science principles (Malaysia Open Science Platform, 2020b). Since 2020, MOSP has held five rounds of capacity-building programmes, designating participants, particularly academic librarians, as data stewards who support researchers in RDM and advance open science practices (Malaysia Open Science Platform, 2020a). RDM training equips librarians with critical skills to guide researchers throughout the data lifecycle, a need highlighted by studies showing the importance of new skills in librarians' RDM roles (Chigwada et al., 2019; Federer, 2018; Kennan, 2016; Riyanto et al., 2019; Semeler, et al., 2019; Tenopir et al., 2016).

However, despite the recognition of librarians' important role in RDM (Cox & Pinfield, 2014), many face significant challenges in developing the required expertise and skills to keep pace with these evolving demands. Ongoing discussions about librarians' RDM capacity are driven by the challenges associated with adopting RDM as a new service. Gaps in skills and limited capacity among librarians have been identified as significant challenges in the provision of RDM services (Cox et al., 2017; Cox & Pinfield, 2014; Perrier et al., 2018; Piracha & Ameen, 2019). Librarians' limited access to training opportunities hinders the development of RDM services (Tang & Hu, 2019; Yu, 2017). This challenge is further compounded by the lack of institutional capacity building programmes (Chiware & Becker, 2018). Tammaro and Casarosa (2014) highlight the early stage of professional development in RDM, noting the absence of a structured framework for continuous capacity building, peer learning, and practical experience. They emphasise the need for a flexible educational approach to address the diverse needs of information professionals due to the interdisciplinary nature of RDM. As a result, academic librarians may struggle to fully meet the expectations of supporting data management across diverse research disciplines. Addressing these challenges will require a more comprehensive approach to training and professional development, equipping librarians with both the technical and strategic skills necessary for the evolving landscape of research data stewardship.

The Scholarship of Teaching and Learning (SoTL) offers a promising framework for enhancing professional competencies by integrating reflective practice, evidence-based learning, and peer teaching. Huber and Morreale (2002) describe SoTL as being "anchored in inquiry and engagement," emphasising that it reconceptualizes teaching as an ongoing scholarly process focused on fostering learning. SoTL's emphasis on continuous learning and knowledge sharing aligns well with the needs of academic librarians, who must not only develop their own RDM skills but also engage in training and guiding researchers in their institutions. Despite this potential, the application of SoTL to RDM capacity building has been minimally explored. While existing literature addresses technical aspects of RDM training and practices (Tenopir et al., 2016; 2017; Xu, 2022), there is a noticeable gap in studies that focus on how academic librarians can develop their expertise through structured, reflective, and collaborative learning approaches. This gap highlights the need

for a deeper understanding of how SoTL can be used to strengthen RDM competencies in academic libraries.

Motivated by this gap, the current study seeks to explore how SoTL-informed training interventions can enhance the RDM skills of academic librarians in research-intensive universities in Malaysia. By addressing both individual development and community learning, this study aims to uncover best practices and strategies for librarians to better support researchers in managing research data, ultimately contributing to more effective RDM services across institutions. This leads to the formulation of two research questions that will guide the study:
(a) How do academic librarians develop their expertise to better engage researchers and support researchers' learning in Research Data Management?
(b) How does SoTL-based training improve the RDM competencies of academic librarians and their capacity to collaborate with and support researchers in Malaysia effectively?

LITERATURE REVIEW

Capacity building is essential for librarians to effectively fulfill their roles and achieve their objectives in an increasingly complex information landscape. While often equated with training, capacity building encompasses a broader range of strategies aimed at addressing job-related challenges and enhancing professional competencies (Sadlapur & Kamble, 2021). Regarding capacity building in RDM, Ashiq and Warraich (2023) conducted a literature review on data librarianship, highlighting capacity building as a critical component for developing effective RDM services. They emphasise that librarians must first acquire new RDM-related skills to build the expertise required for their roles. Similarly, an earlier study (Antell et al. 2014) underscore the importance of skill development in enabling librarians to effectively support RDM. The provision of RDM services and managing data-related roles require librarians to possess specific skills, competencies, and knowledge, as highlighted in various studies and literature (Cox et al., 2017; Kennan, 2016; Latham, 2017; Lyon, 2016; Tenopir et al., 2017) . Schmidt and Shearer (2016) emphasised that librarians engaged in RDM need a foundational understanding of disciplinary landscapes, norms, and data management standards. Consequently, capacity building remains a critical issue, as more recent studies on developing confidence and acquiring the appropriate skill set for librarians in this emerging service area are limited, highlighting the ongoing challenge (Corrall et al., 2013; Cox et al., 2017).

The lack of recent studies addressing the capacity-building needs of librarians highlights the persistent challenges in developing expertise for emerging RDM services. While various approaches have been proposed to enhance RDM capacity among librarians, many of these rely on older studies and do not adequately reflect current advancements or challenges in the field. Librarians require training that supports all levels of staff in delivering effective RDM services (Frederick & Run, 2019). Participating in such training is a key initiative aimed at bridging skill gaps in RDM among librarians (Chiware & Becker, 2018; Federer, 2018; Yu, 2017). Earlier works emphasise that capacity building primarily occurs through formal training, equipping librarians with the necessary skills for effective data stewardship (Corrall et al., 2013). In response to these needs, libraries have introduced diverse initiatives, such as formal RDM training programme (Antell et al., 2014). However, despite advancements, challenges persist. Tang and Hu (2019) highlighted the absence of standardized training programmes and institutional support as significant barriers. Moreover, librarians often encounter limited opportunities for ongoing skill development,

such as training due to time constraints, inadequate resources (Saleem et al., 2020), insufficient funding, absence of policies, and limited support from university management (Cox et al., 2019; Ohaji et al., 2019; Saleem et al., 2020). Moreover, a lack of proper needs assessments for training programmes and dedicated RDM capacity building further exacerbates the issue (Imam et al., 2021; Mthembu & Ocholla, 2022).

In addition to formal training, capacity building in academic libraries often emphasises continuous learning and peer engagement. Librarians can expand their skills through various professional development opportunities, including conferences, workshops, staff exchange programmes, and visiting initiatives (Nwabueze & Anike, 2016; Nwofor et al., 2023; Oyighan & Dennis, 2016) . Mentorship plays a vital role, allowing librarians to gain insights and guidance from experienced professionals (Nwabueze & Anike, 2016; Saka, 2020; Tsekea, 2021). Collaborative efforts among peers further foster a supportive environment for knowledge exchange and skill enhancement (Adunni & Omolara, 2023; Lavoie, 2022). Libraries benefit from a more effective learning environment when these initiatives are well-structured and evaluated. However, formal learning should not overshadow the creative exploration necessary for continuous development (Leong, 2014). For example, librarians increasingly pursue self-guided learning through resources such as the DataCure discussion list, DataQ, and social media communities such as #datalib, and utilise online RDM tools, such as the University of Edinburgh's MANTRA and DataONE modules (Frederick & Run, 2019; Patterton et al., 2018; Shelly & Jackson, 2018).

Additionally, Fuhr (2022) and Nakaziba & Ngulube (2023) highlight that, given the limitations of formal training, self-directed learning serves as a valuable complement, enabling librarians to stay updated with the evolving practices of RDM. Combining structured training, self-directed learning, and peer engagement is essential for effectively supporting RDM in academic settings. Peer learning and knowledge sharing further bolster capacity development. Research by Brown et al. (2015) and Saka (2020) highlights the value of professional networks and collaboration, where librarians benefit from mentorship and shared experiences. This collaborative approach aligns with the SoTL framework, which supports peer-led training as a model for professional growth.

SoTL is a systematic approach that focuses on enhancing student learning by improving teaching practices and sharing these outcomes publicly (Hutchings & Shulman, 1999). It emphasises reflective practice, scholarly inquiry, and sharing effective teaching strategies, with an emphasis on discipline-specific knowledge (McKinney, 2007) . As Beltman (2009) notes, professional development and interactive methods like coaching support educators' ongoing growth. This aligns with findings by Karabenick & Conley (2011), who highlight that professional development enhances teaching effectiveness. SoTL is well-suited for both education and library fields, as both librarians and educators often take on instructional roles. It encourages reflective thinking, continuous improvement, and professional development (Mitchell & Mitchell, 2015). Educators and librarians alike may acquire teaching skills on the job rather than through formal training (Perera, 2019). While librarians may attend formal training, Walter (2006) found they often turn to independent learning and peer support afterward. The application of SoTL in Perini's (2014) study highlights its role in empowering librarians to bridge knowledge gaps through networking and professional connections, ultimately fostering capacity building. SoTL emphasises peer engagement, aligning with the values of a community of practice and peer partnership (Barnard et al., 2011; Kahn et al., 2013). Through active participation in SoTL, librarians can enhance their professional growth by sharing best practices, collaborating with colleagues, and seeking constructive peer feedback to refine their skills and knowledge (Osborn, 2017).

To effectively enhance RDM capacity-building initiatives, it is essential to provide structured training programmes that focus on core competencies such as data management planning, data sharing, and compliance with ethical standards (Xu, 2022). While much research focuses on RDM and capacity building separately, few studies explore how librarian-led training, supported by SoTL principles, can enhance professional growth in RDM. Incorporating SoTL principles can facilitate reflective practice and ongoing professional growth. Furthermore, establishing partnerships with faculty and researchers can enhance the relevance of training programmes, ensuring that they meet the actual needs of the academic community (Harrison, 2018). This gap presents an opportunity for further exploration.

THEORETICAL LENS: SoTL FOR RDM CAPACITY BUILDING

Incorporating the principles of SoTL into RDM capacity building for librarians can be effectively framed through Boyer's four domains of scholarship: discovery, integration, application, and teaching (Boyer, 1990). Each domain provides a distinct lens for enhancing librarians' professional development in RDM. This study adopts SoTL as a theoretical framework to explore how its principles can guide librarians in improving their skills while fostering peer development through training and knowledge-sharing sessions. The core principles of SoTL that correspond to systematic reflection, evidence-based teaching, and peer learning (Gansemer-Topf et al., 2024; Kenny et al., 2017), encourage continuous improvement in RDM capacity. Reflective practice enables librarians to regularly evaluate and enhance their RDM competencies, ensuring that their approaches evolve with emerging data management needs. Evidence-based teaching promotes the development of training programmes grounded in research and best practices, thereby improving the quality of RDM support librarians offer. Furthermore, collaborative learning encourages knowledge sharing and peer feedback, fostering a supportive, dynamic learning environment that promotes both individual growth and collective advancement. This holistic approach, grounded in SoTL principles, supports librarians not only in gaining new skills but also in contributing to a broader culture of shared learning within their institutions.

METHOD

This study employed a qualitative research design to explore how academic librarians from five research-intensive universities in Malaysia develop their capacity in RDM using SoTL as a guiding framework. The focus on these universities is justified by their prominence in research activities, making them pivotal in advancing RDM practices. Additionally, the study incorporates the MOSP, emphasising its role in training librarians in data stewardship and capacity building, which aligns with the broader goals of fostering open science and effective RDM in Malaysia. In-depth interviews were conducted to gain insights into the experiences of these librarians with SoTL-based interventions, particularly librarian-led training sessions. Participants were selected through purposive sampling based on their involvement in RDM services and participation in relevant professional development activities. Priority was given to academic librarians who had received training in RDM or conducted peer teaching as part of SoTL-interventions. Notably, some librarians engaged in peer teaching without prior knowledge of SoTL, highlighting the need for clearer communication about its principles and benefits.

A formal email invitation was sent to the chief librarians of the five research-intensive universities in December 2020 and January 2021, outlining the study's objectives and requesting permission to interview their librarians. The email included the Participants Information Sheet and the participant criteria to help chief librarians identify or recommend suitable candidates for the interviews. A total of 15 participants who met the specified criteria were recruited from these universities, which is consistent with qualitative research standards for achieving data saturation (Guest et al. 2006). This sample size is sufficient to provide diverse insights and identify themes relevant to RDM capacity building (Creswell & Poth, 2018). To maintain confidentiality, participants' names have been anonymised and replaced with assigned codes (L01 to L15) (see Table 1). All participants provided consent after receiving detailed information about the study's purpose, data collection methods, and their right to withdraw at any stage.

Table 1: Demographics Information of the Study Participants

No	Informant code (age)	Institution code	Gender	Position (Academic qualification)	Division/Unit/Position
1	L01 (40)	U1	Male	Assistant Chief Librarian (Master's degree)	Head, Research Support Division
2	L02 (42)	U1	Female	Senior Librarian (Master's degree)	Research Support Division
3	L03 (35)	U1	Female	Senior Librarian (Bachelor's degree)	Research Support Division
4	L04 (36)	U1	Male	Senior Librarian (Bachelor's degree)	Data, Repository and Scholarly Communication Division
5	L05 (45)	U2	Female	Senior Librarian (Master's degree)	Head, Archive Unit
6	L06 (37)	U2	Female	Senior Librarian (Master's degree)	Information Systems
7	L07 (40)	U2	Female	Senior Librarian (Master's degree)	Archive Unit
8	L08 (49)	U3	Female	Assistant Chief Librarian (Master's degree)	Head, Research Service
9	L09 (50)	U3	Female	Assistant Chief Librarian (Doctoral degree)	Head, ICT & Multimedia Maintenance
10	L10 (42)	U3	Male	Deputy Chief Librarian (Master's degree)	Head, Library Branch
11	L11 (39)	U4	Female	Senior Librarian (Doctoral degree)	Information Services
12	L12 (56)	U4	Female	Deputy Chief Librarian (Master's degree)	Head, Research and Information Services
13	L13 (44)	U5	Male	Assistant Chief Librarian (Master's degree)	Head, Automation
14	L14 (46)	U5	Female	Senior Librarian (Doctoral degree)	Gallery Research
15	L15 (37)	U5	Female	Senior Librarian (Bachelor's degree)	Research Data Management

Qualitative data were collected through semi-structured interviews with participants, each lasting approximately 50 to 90 minutes. All interviews were conducted via Google Meet, as participants expressed a preference for online sessions due to convenience and flexibility. Each session was recorded directly on the platform and backed up using a live screen recording application, Live Screen Capture by Corel VideoStudio X10. An interview protocol (see Appendix) guided the sessions, ensuring that questions were asked and responses were accurately recorded. The interviews delved into participants' experiences with RDM-related professional development activities framed by the principles of the SoTL. While no

specific terms related to SoTL were explicitly used, the questions were designed to explore concepts aligned with Boyer's (1990) four domains: discovery, integration, application, and teaching. Each domain provided a distinct perspective on enhancing librarians' professional development in RDM. The questions focused on participants' reflections on conducting or receiving librarian-led training, the influence of these activities on their RDM competencies, the challenges encountered, and how teaching others reinforced their understanding of RDM.

To ensure trustworthiness, the study employed triangulation, member checking and maintaining an audit trail to enhance the credibility, dependability, and confirmability of the findings (Lincoln & Guba, 1985). All recorded interviews were transcribed, coded, and examined based on participants' responses to identify and construct key themes. This study employs the interactive model of data analysis proposed by Miles and Huberman (1994), which consists of three components: data reduction, data display, and conclusion drawing. These components were developed during and after data collection to streamline the qualitative data analysis process and enhance clarity. The interview data were analyzed using thematic analysis, employing the ATLAS.ti software programme to facilitate the sorting, organisation, and management of qualitative data. The thematic analysis adhered to the steps outlined by Saldana (2016), transforming the research data into codes, categories, and themes. Key themes identified in the analysis included acquiring RDM skills, training, professional networks, knowledge sharing, and collaboration in professional development. By focusing on these themes, the study offers a comprehensive account of how SoTL-based training and peer instruction contribute to capacity building within the context of Malaysia's research-intensive universities.

FINDINGS

To address the first research question - *How do academic librarians develop their expertise to better engage with researchers and support researchers' learning in Research Data Management*? - the findings identified and categorised four strategies into main approaches (see Figure 1). These approaches represent the key methods librarians employed to enhance their RDM skills and more effectively support researchers in their RDM learning.

Acquiring RDM Competency

The first approach emphasises acquiring RDM competency. Librarians recognised the importance of equipping themselves with the necessary skills and knowledge before engaging with researchers about RDM services and activities. Their effectiveness in conveying the value of RDM services was greatly influenced by their individual strategies. The study identified six strategies that librarians employed to achieve this, as illustrated in Figure 2. These strategies reflect the diverse methods used to enhance their readiness and confidence in providing RDM support to researchers.

Figure 1: Key Approaches Librarians Use to Build Expertise and Enhance Engagement with Researchers in RDM

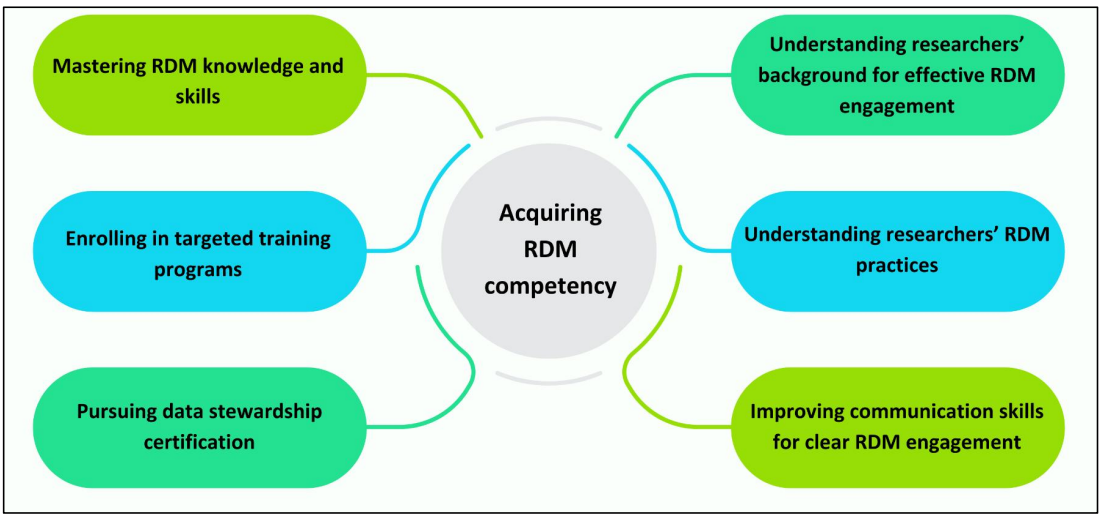

Figure 2: Strategies Employed by Librarians to Acquire RDM Competency and Enhance Engagement with Researchers

(a) Mastering RDM knowledge and skills

Librarians recognised the necessity of mastering RDM skills and knowledge to effectively engage researchers in RDM activities. This mastery entails a comprehensive understanding and proficiency in various RDM practices, including data organisation, storage, sharing, and preservation. It also involves expertise in data formats, metadata standards, data management planning, data security, and compliance with ethical and legal regulations. By developing proficiency in RDM, librarians can provide valuable guidance and support to researchers throughout the data lifecycle, thereby facilitating effective data management practices. Most responses underscored the importance of acquiring these RDM skills before attempting to persuade researchers to participate in RDM initiatives. Thus, librarians' preparedness with the relevant skills and knowledge is crucial for meaningful engagement in RDM efforts, as highlighted by participants L02 and L14.

"To ensure that the service on RDM runs well, effectively, then we really need the necessary skills to engage with the researchers" (17:90 p 24 in L02)
"We must equip ourselves with the knowledge of RDM because we want to deal with researchers" (28:69 p 20 in L14)

(b) Enrolling in Targeted Training Programmes
This strategy focuses on equipping librarians with targeted instruction and development programmes to effectively engage researchers in RDM activities. These programmes include workshops, seminars, online courses, and hands-on training sessions that enhance librarians' understanding of RDM principles, tools, and best practices. By participating in these training opportunities, librarians become better prepared to support researchers in managing and sharing their data effectively. While most librarians in this study have received training on data stewardship related to RDM, L07 and L14 emphasised the need for continuous participation in training and subsequent revisions to ensure they are well-equipped before engaging with researchers. The skills and knowledge gained from this training are essential for fostering meaningful interactions with researchers in RDM.
"So, before we want to start this (engaging with researchers), we have to study first, and we need to go for training" (21:38 p 15 in L07)
"As a data steward, I must be fully prepared before engaging with researchers. This preparation requires me to revise, to enhance the skills I got during my training." (28:74 p 21 in L14)

The study found that a few librarians participated in formal, structured training programmes focused on RDM, such as eLearningcurve and MOSP. MOSP's programmes were specifically designed as train-the-trainer and certification initiatives to strengthen data stewardship capacity within libraries. Participants L03 and L14 shared that their chief librarians had nominated them, and they were subsequently selected by the Academy of Sciences Malaysia (ASM) for this specialised training, aimed at preparing them to serve as data stewards.
"I am excited to announce that ASM has nominated me for data stewardship training with other librarians, research officers, and lecturers!" (18:11 p 6 in L03)
"The chief librarian, she suggested my name to MOSP" (28:41 p 10 in L14)

The study also found that two librarians engaged in informal, self-directed training without directives from university management or the chief librarian. Participants L02 and L03 noted that programmes like MANTRA and RDMLA were offered free of charge, motivating them to participate and acquire RDM skills and knowledge without financial barriers.
"This is MANTRA, I attended MANTRA because it is free" (17:34 p 10 in L02)
"Last year, we participated in the free training programme, free of charge by RDMLA" (18:12 p 7 in L03)

(c) Pursuing data stewardship certification
The study found that becoming an expert in RDM is a key approach librarians can use to engage researchers in RDM services. This expertise often involves pursuing formal accreditation or certification in data stewardship through specialised training programmes or courses. Such certification validates librarians' proficiency in managing research data, encompassing areas like data curation, metadata standards, data privacy, and ethical considerations. By obtaining this certification, librarians demonstrate their commitment to professional development and their capability to offer high-quality support and guidance to researchers in RDM practices. A few librarians involved in RDM have participated in data stewardship programmes, such as those offered by eLearningcurve and MOSP, successfully

obtaining certification as data stewards. L13 and L14 emphasised that achieving certification enhances their ability to engage researchers effectively in RDM activities and services.

"This training is especially important given the growing demand for [certified] data stewards." (27:14 p 6 in L13)

"How can we claim to be experts if we are not certified to engage effectively with researchers." (28:78 p 23 in L14)

(d) Understanding researchers' background for effective RDM engagement

Understanding researchers' backgrounds for effective RDM engagement involves librarians familiarizing themselves with the diverse disciplines, research practices, and specific needs of the researchers they support. By gaining insight into researchers' priorities and challenges, librarians can tailor RDM services more effectively. L10 and L06 stressed that knowing researchers' backgrounds is key to developing relevant RDM services. L10 noted that this knowledge helps librarians prioritise which researchers should be involved, describing the process as straightforward and easy to implement during the initial stages of RDM awareness activities

"In the early stages, it is possible to focus on awareness while also identifying the researchers or target group for RDM services. *Do they really need this RDM? How do they currently manage their research data? If the target group or stakeholders show a need, implementation becomes much easier*" (9:16 p 12 in L10)

L06 highlighted the importance of librarians understanding the researchers' background knowledge, including the metadata associated with their research data, to ensure alignment with their specific field. As L06 explained, "*The background knowledge of librarians has to be matched with the background of researcher*s." (5:37 p 15 in L06). This alignment enables librarians to provide relevant, discipline-specific guidance and support, particularly regarding metadata, enhancing the effectiveness of RDM services.

(e) Understanding researchers' RDM practices

Understanding researchers' RDM practices involves examining how they manage data across the research lifecycle, from collection and organisation to storage, sharing, and preservation. These practices help reveal which RDM services that the library can implement to best support the research community. To assess these needs, librarians conducted pilot surveys and interviews to explore researchers' current data management methods. L01, L02, and L12 emphasised that the librarians focused particularly on how researchers store and share their data.

"We did a survey earlier and found that our researchers at the university have a really low awareness of RDM. Because of this, we realised that before we seriously implement [RDM services], we need to focus on creating more awareness among them first." (1:13 p 3 in L01)

"So, the pilot study and also the interview are aimed at knowing how researchers manage their research data" (2:38 p 14 in L02)

"The pilot study, well our researchers mainly keep their data for themselves and use different storage methods. They do not really share it widely, only share with others working on the same project." (11:11 p 7 in L12)

These librarians emphasised the importance of conducting preliminary studies to understand researchers' current RDM practices. They thought that this proactive approach ensures that the support offered is relevant and tailored to the unique contexts of the researchers, ultimately fostering more effective collaboration and enhancing the overall research experience.

(f) Improving communication skills for clear RDM engagement

Another key strategy is improving communication skills to ensure clarity in RDM discussions with researchers. This involves conveying complex RDM concepts in a way that researchers and other stakeholders can easily understand. A librarian in this study stressed the importance of using consistent language between librarians and researchers to avoid misunderstandings. L13, with experience in metadata, highlighted the need for detailed explanations to help researchers fully grasp RDM requirements, particularly when it comes to recognising the importance of metadata for storing data in repositories. This approach helps bridge gaps in understanding and facilitates smoother communication.

"Librarians and researchers need to use a consistent language. For example, when discussing metadata, when dealing with raw datasets, metadata might include details such as file formats (e.g., CSV, Excel), the number of data entries or records, variables being measured, date of data collection, or even the software used to generate the data. This means ensuring that both sides understand and use the same terms, and that we clearly explain each data requirement." (27:99 p 42 in L13)

Utilizing Professional Connections

The second approach to building expertise is engaging professional networks, where librarians use their professional connections to enhance their ability to achieve RDM goals or solve challenges. The librarians in this study tapped into their existing networks with researchers to promote RDM services. Whether through formal collaborations or informal interactions, these networks allowed librarians to strengthen their engagement with researchers and deepen their understanding of RDM needs. Engaging with researchers' personal networks was particularly effective, as highlighted by L15, who described working with researchers who favoured a more personalized approach to data storage and management.

"The researcher asked if there is a system [digital repository] that he can store research data so that the future is easy for him to access" (29: 131 p 52 in L15)

L02 noted that engaging with researchers who regularly used library services and joined data stewardship training made it easier to develop RDM services. She emphasised that researchers from these networks were more likely to support librarians, particularly in storing research data in repositories. She mentioned, "Researchers or research officers involved in the MOSP ToT [training of trainers] with us, even if they are not librarians, are people we can reach out to." (17:94 p 24 in L02)

Participants stressed the necessity of maintaining ongoing engagement with researchers for effective RDM services. Based on their experiences with other library services, they observed that researchers often keep in touch with librarians for inquiries. This trend is anticipated to carry over to RDM, with librarians continuing to assist researchers by answering questions and providing guidance on RDM activities and services. This highlights that successful RDM services rely on consistent communication and support between both librarians and researchers, as denoted in the following verbatims:

"When there is a problem there, we have to interact back, verify with the depositor [of research data], and then confirm that the data is accurate." (4: 117 p 33 in L04)

"RDM operates at another [higher] level, researchers should feel free to ask us questions, and we need to keep in touch with them since they will be depositing their data." (28:76 p 23 in L14)

Gaining the support of senior researchers is essential for librarians to effectively promote engagement with RDM activities and services. For instance, L01 and L03 involved highly-

cited researchers from their networks, understanding that these established scholars, known for their extensive publications and citations, could influence their peers on RDM services. This strategy helps foster engagement and gather feedback during the development of RDM services.

"It will work if we involve researchers with many publications on the committee, as they can help convince peers to share data." (16: 125 pp 31 - 32 in L01)

"We want feedback from senior researchers with many publications and citations. Their data can be used as a project to store in our repository." (3:26 p 11 in L03)

Targeting active researchers who already store their data in open repositories is also an effective strategy. This helps librarians learn from these researchers' practices and apply those insights to developing RDM services.

"*We will focus on popular platforms like Mendeley Data, Zenodo, and Figshare to identify our researchers who are using them. Then, we will reach out to these researchers and ask them to share practices that could be applied to our repository*." (17:97 p 25 in L02)

Building Research Partnerships

The third approach is building research partnerships, which involves creating collaborative relationships between librarians and researchers to enhance research outcomes and support RDM. This collaboration can take many forms, such as working together on shared goals, such as improving data management practices, increasing research visibility, and ensuring compliance with funder and institutional requirements. It also includes providing tailored support to research teams based on their specific needs and disciplines. This support may involve assistance with Data Management Plans (DMPs), metadata standards, data-sharing strategies, and conducting systematic literature reviews (SLRs). As L09 and L12 noted, librarians can engage at various stages of research projects, extending their role beyond traditional tasks like literature reviews. In the context of RDM, they can become research partners with those actively managing their data, requiring a deeper level of engagement to effectively meet researchers' needs.

"We have been doing embedded [librarianship], which means we sit with them [researchers] and become part of their research team. In the past, we mostly focused on literature reviews." (8:30 p 13 in L09)

"It is perfectly fine to just offer advice on [managing] research data. In that case, we could become research partners involved in two or three out of say five processes, while the researchers handle the rest. This means we are engaging at a deeper level." (26:72 p 25 in L12)

Initiating RDM Services

The study participants emphasised that launching RDM services was a key strategy for enhancing their engagement with researchers through theoretical knowledge. This involves establishing comprehensive support systems to assist researchers in managing their data throughout the research lifecycle. Consequently, the librarians involved in this study identified five essential RDM services to initiate: Data storage, DMPs, Awareness programmes, Training programmes, and Consultation. Table 2 not only summarises the services but also captures the librarians' insights and experiences, providing a more comprehensive understanding of their approaches to RDM.

Table 2: Essential RDM Services Identified by Librarians with Supporting Quotes from Interviews

No.	**Initiating RDM Services**	**Example verbatim 1**	**Example verbatim 2**
1	Data storage - Providing secure and reliable options for researchers to store their data.	*"We provide the data repository, and we provide metadata to make retrieval easy for users."* (9:47 p 25 in L10)	*"We offer a structured platform (repository), which allows our researchers to share data."* (16:157 p 15 in L01)
2	DMPs - Assisting researchers in creating structured plans that outline how they will manage their data throughout the research process.	*"We provide researchers with a specific template to follow for their data management plans, helping them effectively convey their data story."* (19:25 p 10 in L04)	*"We know a lot, so we can assist them, especially when it comes to creating DMPs. Engaging with them makes this process much easier."* (26:71 p 25 in L12)
3	Awareness programmes- Initiatives aimed at educating researchers about the importance and benefits of effective data management.	*"That is why we started the "Tokoh Penyelidik" project. We approached a researcher and explained our goals to raise awareness. They ended up wanting to share their research output, including data. But, we had to engage with each researcher individually."* (14:67 p 19 in L15)	*"It is essential to raise awareness through seminars and webinars, where we can clearly explain the benefits. I am actively promoting this initiative."* (12:68 p 39 in L13)
4	Training programmes- Workshops or courses designed to equip researchers with the necessary skills and knowledge for managing their data effectively	*"When we develop RDM training module for researchers, it is tailored to their goals, as they are eager to succeed in the initiative and share their data."* (16: 151 p 38 in L01)	*"We usually run information skills courses and invite researchers to participate. But when we have RDM, we make sure to include elements of RDM in the info skills, essentially weaving the RDM story into the training."* *(24:87 p 23 in L10)*
5	Consultation - One-on-one support to help researchers address specific challenges related to data management.	*"The engagement approach was similar to one-on-one consultations. It is about how we connect with lecturers on a personal level."* (24:86 p 23 in L10)	*"We have more consultations, a bigger percentage than training sessions."* (23:95 p 37 in L09)

RDM Capacity Development through SoTL

To address the second research question - *How does SoTL-based training improve the RDM competencies of academic librarians and their capacity to collaborate with and support researchers in Malaysia effectively?* - the four approaches (see Figure 1) that represent the key methods librarians employed to improve their RDM skills and support researchers in their RDM learning were examined. When asked how the approaches improve their RDM competencies, librarians emphasise the importance of sharing knowledge and resources, which aligns closely with the principles of SoTL. Although they may not be familiar with the term "SoTL", nor was it explicitly mentioned or probed by the interviewers, they consistently highlighted the significance of knowledge sharing in enhancing their RDM capacity building. The findings illustrate that SoTL-based interventions, which emphasise collaboration, reflective practices, and peer-led training, played a critical role in enhancing the RDM competencies of librarians. Those who led these training and sharing sessions not only deepened their own understanding of RDM concepts but also provided tailored, context-driven instruction that benefited their peers. This peer-led model allowed for a more hands-on, practical learning experience, which is key to the development of specialised skills like RDM.

The study identified two distinct groups of librarians based on their RDM knowledge-sharing practices: those focused on sharing within their university and those actively engaging in sharing outside their university. These approaches (see Figure 3) supported both internal capacity building and wider engagement with the research community, aiding the overall development of RDM services. Sharing within the university typically involved close collaboration with other librarians and researchers, while sharing outside expanded knowledge exchange with external stakeholders and institutions. This promoted a culture of openness and mutual learning across the academic landscape. The parallel knowledge-sharing approach reflects a holistic capacity-building strategy, aligning well with SoTL's core principles of collaboration, reflective learning, and continuous improvement through shared experiences.

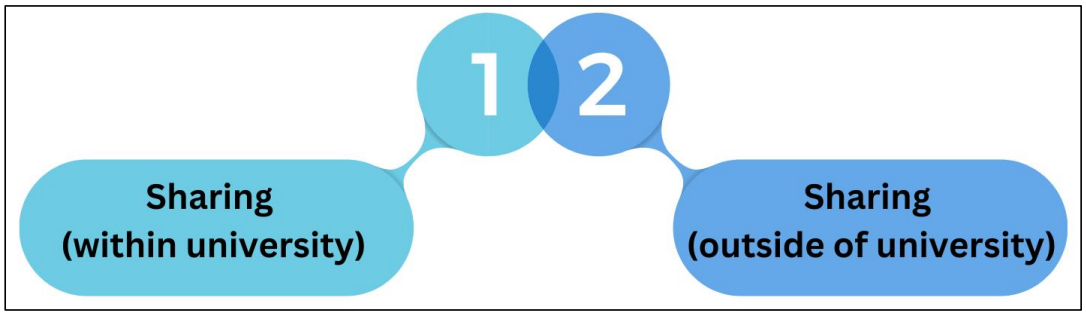

Figure 3: Parallel Knowledge-Sharing Practices Capacity Building in RDM Services Among Librarians

(a) Sharing (within university)

All librarians in this study who had acquired RDM skills and knowledge actively shared them with their peers within their library, reflecting a core aspect of SoTL - knowledge sharing as a means of professional development. Librarians highlighted that sharing after attending training or conferences was a regular practice, aligning with SoTL's focus on collaborative learning. This was particularly true for those who participated in MOSP's data stewardship training. L02, for instance, described how she shared her RDM knowledge with colleagues, ensuring that they, too, could apply the training content in their roles. This practice not only helped L02 retain her knowledge but also fostered a collaborative learning environment, ensuring that her peers were equally equipped with the skills and knowledge necessary for effective RDM, which is consistent with SoTL's emphasis on reflective practice and peer learning.

"We know that not all librarians can attend MOSP training, so after gaining knowledge on RDM, we organised sharing sessions and briefings for all librarians through staff seminars. This way, we could ensure that the knowledge is passed on and no one is left behind." (17:73 p 20 in L02)

In another instance, L13 was invited to speak on data stewardship during a webinar organised by his library to raise awareness among the university community. This event aimed to share his expertise with colleagues, and the chief librarian encouraged all staff to attend, ensuring they could enhance their RDM skills and knowledge. "*I gave a talk in a webinar as a follow up from MOSP training. Our chief librarian made it mandatory for everyone to attend. The goal was to help librarians understand open science, data stewardship, and RDM."* (27:72 p 28 in L13)

Similarly, L09 has experience sharing conference content related to RDM with her peers during knowledge-sharing sessions. "*When I went to the IFLA conference, I was particularly*

interested on papers about RDM. So, there was one presentation on data scientists and data librarians that really caught my attention, by a PhD student. When I got back, we had to present in a knowledge-sharing session, and I ended up presenting that paper too." (23:10 p 6 in L09)

Knowledge sharing was not limited to formal sessions. L08 mentioned she preferred "chatting with her peers to share RDM-related training materials" (22:78 p 29 in L08). Similarly, L07 shared knowledge from webinars through a WhatsApp group, which is a simple way for librarians to exchange information. "*While working from home during the pandemic, other universities held webinars on Open Science. I watched, and then shared what I learned in our [WhatsApp] groups."* (21:65 p 26 in L07). These informal practices, alongside formal sessions, allowed librarians to share knowledge more freely and effectively.

Librarians not only shared their RDM knowledge but also actively provided valuable information sources to their peers. They often recommended tutorials, relevant websites, and webinars to help others deepen their understanding of RDM. This practice encouraged continuous learning and retention of knowledge among their colleagues. For example, L04 and L07 emphasised that sharing these resources helped their peers gain more in-depth information on RDM, fostering an environment of collaborative learning and growth within their library.
"Then I had suggested my colleagues explore the websites themselves, saying something like, 'I learned from here, and you can check it out yourself too'." (19:100 p 30 in L04)
"If I find any good tutorials or sources, I just drop the links in the WhatsApp group and post, 'take a look, this is where we can learn from'." (21:56 p 22 in L07)

The librarians in this study agreed that collaborative learning is a key approach for enhancing RDM skills and knowledge among stakeholders within the university. A few of them said that maintaining RDM knowledge relies heavily on ongoing communication between librarians and the Research Management Centre (RMC). This collaboration ensures that RDM knowledge is consistently updated and effectively shared. Organising RDM workshops and peer-led teaching sessions with researchers is a practical way to enhance and solidify RDM skills among all stakeholders, demonstrating a strong commitment to continuous professional development in this field, as illustrated in the following remarks:
"We really need to get on the same page with our skills, making sure we have both IT knowledge and a solid grasp of RDM. It is important for RMC and the library to keep the lines of communication open between us, this is key to sharing information effectively. To make this even better, we could host workshops that include some peer teaching so we can all learn from each other." (29:100 p 43 in L15)

L01 suggested that while individuals have their own areas of expertise, recognising that there is always more to learn from peers fosters personal and professional growth: "*We each have our strengths, but there is so much we can learn from others. As long as we stay humble and open to learning, we can gain a wealth of knowledge for ourselves."* (16:141 p 35 in L01). This mindset encourages collaboration, open-mindedness, and continuous improvement, highlighting the value of shared knowledge in enhancing one's skills and understanding. Overall, the practice of sharing knowledge both formally and informally highlights a flexible and inclusive approach to professional development among librarians. This reflects an organic, community-driven method of capacity building, where formal training sessions are complemented by day-to-day interactions. The informal nature of

these exchanges makes knowledge sharing more accessible and helps integrate RDM practices into everyday workflows, fostering a culture of learning and mutual support within a university community.

(b) Sharing (outside of university)

While all librarians actively share RDM knowledge within the university, only those with particularly strong expertise extend their efforts beyond its walls. For example, two librarians in this study (L09 and L13) were invited by other universities to share their specific skills and knowledge on data stewardship, as well as their experiences in developing and providing RDM services. Additionally, a government agency invited L13 to share his expertise in data stewardship: "*Most recently, I gave a talk to SSM (Companies Commission of Malaysia) on data stewardship, well it was all about transferring knowledge and sharing experiences."* (27:68 p 26 in L13)

Another proactive role that librarians take in sharing their knowledge and expertise in RDM beyond their institutions is reflected in L09's acceptance of an invitation to present at an international seminar: "*Last year, I presented a paper at the University of Indonesia, they invited us to discuss the roles of the library in research support. I highlighted several key roles, including data steward and RDM training*." (23: 114 p 44 in L09). L09 emphasised the significance of training, as she shared insights gained from her experiences. This indicates that continuous learning and sharing are essential for librarians to maintain and enhance their RDM competencies.

In RDM capacity building, librarians from various universities actively sought out experienced colleagues to gain insights into their RDM service development and progress. L02 and L15 highlighted that these librarians are not only focused on their own growth but are also dedicated to supporting their peers at other institutions.

"There are also librarians from other universities who contacted us, ask about our experiences. So, we share, over the phone, tell them what we did." (17: 110 p 28 in L02)

"Librarians from IIUM also reached out for benchmarking on RDM services. They wanted to understand our processes, see the planning we have done, and assess how far our repository has advanced, which platforms we are using. This inquiry is more about knowledge sharing." (29: 123 p 49 in L15)

This culture of cross-institutional knowledge-sharing fosters a sense of community and enhances the professional development of everyone involved, cultivating a network rich in shared knowledge and expertise in RDM. This willingness to engage with broader audiences reflects a commitment to the principles of the SoTL, fostering collaboration and promoting continuous learning that could enhance the overall impact of RDM practices.

DISCUSSION

This study highlights the development of RDM expertise among academic librarians in Malaysia, with a particular focus on how SoTL-based training enhances their ability to effectively support and collaborate with researchers. Librarians develop essential RDM competencies through acquiring RDM expertise, utilizing professional connections, forming research partnerships, and initiating RDM services. They prioritise knowledge sharing as a collaborative practice that enhances RDM capacity building among peers, facilitated by cooperative efforts, peer teaching, and cross-institutional collaboration. While knowledge sharing primarily takes place within universities, librarians who excel in RDM are increasingly sought after to share their expertise beyond their own institutions. This cross-

institutional collaboration not only boosts individual capabilities but also strengthens the overall RDM framework across the academic landscape.

This study highlights the importance of librarian-led training in fostering a deeper understanding and broader dissemination of RDM skills and knowledge. These findings align with previous research that notes extensive librarian learning through training programmes such as MANTRA, RDMRose, and DataONE (Cox et al., 2012; Frederick & Run, 2019; Kennan et al., 2014; Patterton et al., 2018; Shelly & Jackson, 2018). Tinuoye et al. (2016) highlighted that training positively impacts librarians' job satisfaction, emphasizing the need for library management to create professional development initiatives that meet expectations. The study also notes that directives from management to participate in training reflect institutional commitment, ensuring librarians receive necessary certifications and can lead internal training.

The findings of this study illustrate how the SoTL framework, through Boyer's (1990) model of scholarship, can be applied to enhance academic librarians' professional development in RDM. By aligning with the four domains of SoTL - Discovery, Integration, Application, and Teaching - the study highlights a dynamic and reflective approach to learning, collaboration, and knowledge dissemination. Each domain corresponds to key aspects of the librarians' capacity-building process. The Discovery domain focuses on librarians acquiring RDM competencies through participation in professional development activities like workshops and peer learning. These efforts enable librarians to gain new insights, reflect on their practices, and identify areas for improvement. In the Integration domain, librarians utilise their newly acquired knowledge by embedding RDM principles into their professional practices. By leveraging professional connections and collaborations, they align these practices with institutional needs and research objectives, fostering more effective data management. Application emphasises how librarians translate their knowledge into practice by initiating and implementing RDM services. This involves creating guidelines, offering training, and supporting researchers throughout the data lifecycle, ensuring a sustainable framework for RDM. Finally, the Teaching domain highlights the role of librarians as educators. By sharing their expertise through peer teaching and collaborative practices, librarians contribute to the professional growth of their colleagues and researchers, building a community dedicated to effective RDM practices. This integrated approach, grounded in the SoTL framework, ensures that librarians systematically develop the competencies necessary for effective data stewardship and collaborative research support.

Formal, structured training is essential for skill development, but informal learning also plays a crucial role (Brown et al. 2015; Simons & Searle, 2014). While previous studies indicate that librarians prefer structured, formal training to enhance their RDM skills (Corrall et al., 2013; Kotarski et al., 2012), this study highlights the complementary value of self-directed learning in RDM capacity building. Despite limitations in formal training availability, librarians in this study actively engage in self-initiated learning, contrasting with earlier findings that suggest limited opportunities for continuous skill development (Saleem et al., 2020). Conrad et al. (2017) noted that while structured RDM training is needed, ongoing education is often hindered by time and resource constraints. However, this study shows that librarians proactively seek learning opportunities, even without direct management mandates, though time limitations remain a challenge. Peer support and access to free training resources further promote these informal learning activities. Librarians frequently engage in informal discussions, workshops, and webinars to exchange RDM knowledge, demonstrating a shared commitment to mutual growth. This culture of

sharing acknowledges that the complexity of RDM benefits from diverse expertise and collaboration. Mirhosseini et al. (2018) emphasised that knowledge sharing, particularly through documentation and dissemination, is a key characteristic of SoTL, enriching the broader understanding of professional practices.

Librarians in this study not only demonstrated a commitment to upskilling their RDM abilities but also made a concerted effort to share insights gained from both formal training and self-directed learning with peers within their institutions. They organised dedicated sessions, presented their findings, and engaged in practical knowledge exchanges with colleagues from other institutions. Their active participation in regional and international conferences, as well as online communities, allowed them to contribute to the global knowledge base in data management while benefiting from peer expertise. This proactive approach aligns with Boyer's emphasis on collaborative networks, where peer-to-peer learning and shared knowledge drive collective growth and strengthen RDM capacity. It also resonates with the SoTL framework, which values public sharing to enhance professional development and enrich the collective knowledge base.

Librarians in this study also regularly assessed their RDM skills to identify areas for growth, embodying SoTL principles of reflective practice and peer learning. By engaging in self-evaluation, they not only fostered their own development but contributed to a continuous learning cycle by supporting their peers. This reciprocal process is central to SoTL and promotes growth for individuals and the academic community. As McNiff and Hays (2017) argue, reflection is foundational to SoTL, enabling educators to refine teaching methods and enrich learning experiences (McKinney, 2007; McNiff & Hays, 2017; Samah et al., 2016). In this study, reflective practices within SoTL involved librarians critically evaluating their RDM capacity-building strategies, identifying areas for improvement, and implementing meaningful changes. SoTL's structure supports this ongoing reflection, leading to meaningful changes in practice.

CONCLUSIONS

In conclusion, this study demonstrates that RDM capacity building among librarians is significantly enhanced through knowledge sharing, collaborative practices, peer teaching, and cross-institutional engagement. This approach not only improves individual skills but also strengthens overall RDM services. SoTL-based interventions, particularly teaching other librarians, are key strategies for professional growth. Fostering a collaborative culture will be crucial in advancing librarians' roles and enhancing research support.

Through Boyer's four domains of scholarship, RDM capacity building can be further explored and reinforced. The scholarship of discovery encourages librarians to engage in research and stay updated on trends in data stewardship, enhancing their capacity to support data-intensive projects. The scholarship of integration fosters connections across disciplines such as data curation, research ethics, and digital technology, improving RDM services. The scholarship of application emphasises the practical implementation of RDM knowledge, guiding librarians in addressing real-world data management challenges and contributing to institutional governance. Lastly, the scholarship of teaching highlights librarians' role in educating researchers and students in RDM, ensuring that knowledge is shared and applied effectively. This offers a comprehensive framework for RDM capacity building, fostering both technical expertise and scholarly growth within the academic community.

The study highlights the importance of fostering continuous learning and collaboration among librarians, offering valuable implications for library management and policymakers. By prioritizing professional development, these efforts can enhance research support quality in academia and improve librarians' RDM competencies. Although limited by its small sample size, research university context, and qualitative focus, it offers rich insights that may not be fully captured through quantitative methods. While it does not address specific RDM capacity building challenges - topics that could be explored in future papers - the in-depth nature of qualitative data allows for a nuanced understanding of librarians' experiences and approaches in RDM capacity building. Future research could enhance these findings by incorporating larger samples and quantitative methods, ensuring broader generalizability while preserving qualitative depth. Additionally, future studies should investigate the long-term impact of SoTL-based capacity building, particularly in relation to collaborative practices and peer teaching, and their role in promoting continuous professional development within academic libraries.

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CONFLICT OF INTEREST

The authors declare that they have no competing interests, including no conflicts of interest regarding the publication of this paper. One of the authors serves as an editor for this journal. To avoid conflicts of interest, this author was not involved in the review or acceptance process of this article.

AUTHOR CONTRIBUTION

Conceptualization: [A.Abrizah]; Methodology: [all authors]; Formal analysis and investigation: [M.I.Ismail]; Writing - original draft preparation: [M.I.Ismail]; Writing - review and editing: [all authors]

REFERENCES

Adunni, A.-B. T., & Omolara, O. K. (2023). Influence of training for capacity building on job commitment of personnel in academic libraries in Ogun State, Nigeria. *The International Journal of Humanities & Social Studies*, *11*(1), 1–9. https://doi.org/10.24940/theijhss/2023/v11/i1/hs2212-007.

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. https://doi.org/10.1016/j.acalib.2021.102378.

Antell, K., Foote, J. B., Turner, J., & Shults, B. (2014). Dealing with data: Science librarians' participation in data management at Association of Research Libraries institutions. *College & Research Libraries*, *75*(4), 557–574. https://doi.org/10.5860/crl.75.4.557.

Ashiq, M., & Warraich, N. F. (2023). A systematized review on data librarianship literature: Current services, challenges, skills, and motivational factors. *Journal of Librarianship and Information Science*, *55*(2), 414–433. https://doi.org/10.1177/09610006221083675.

Auckland, M. (2012). Re-skilling for research: an investigation into the role and skills of subject and liaison librarians required to effectively support the evolving information needs of researchers. *Voced.Edu.Au*, *January 2012*. http://www.rluk.ac.uk/files/RLUK Re-skilling.pdf.

Aydinoglu, A. U., Dogan, G., & Taskin, Z. (2017). Research data management in Turkey: perceptions and practices. *Library Hi Tech*, *35*(2), 271–289. https://doi.org/10.1108/LHT-11-2016-0134.

Barnard, A., Croft, W., Irons, R., Cuffe, N., Bandara, W., & Rowntree, P. (2011). Peer partnership to enhance scholarship of teaching: A case study. *Higher Education Research and Development*, *30*(4), 435–448. https://doi.org/10.1080/07294360.2010.518953.

Beltman, S. (2009). Educators' motivation for continuing professional learning. *Issues in Educational Research*, *19*(3), 193–211.

Boyer, E. L. (1990). Scholarship reconsidered: Priorities of the professoriate. In *The Carnegie Foundation for the Advancement of Teaching*. Carnegie Foundation for the Advancement of Teaching.

Brown, R. A., Wolski, M., & Richardson, J. (2015). Developing new skills for research support librarians. *The Australian Library Journal*, *64*(3), 224–234. https://doi.org/10.1080/00049670.2015.1041215.

Chigwada, J., Chiparausha, B., & Kasiroori, J. (2017). Research data management in research institutions in Zimbabwe. *Data Science Journal*, *16*(0), 31. https://doi.org/10.5334/dsj-2017-031.

Chigwada, J. P., Hwalima, T., & Kwangwa, N. (2019). A proposed framework for research data management services in research institutions in Zimbabwe. In *Research Data Access and Management in Modern Libraries* (pp. 29–53). https://doi.org/10.4018/978-1-5225-8437-7.ch002.

Chiware, E. R., & Becker, D. A. (2018). Research data management services in Southern Africa: A readiness survey of academic and research libraries. *African Journal of Library, Archives and Information Science*, *28*(1), 1–16. https://www.ajol.info/index.php/ajlais/article/view/174148.

Conrad, S., Shorish, Y., Whitmire, A. L., & Hswe, P. (2017). Building professional development opportunities in data services for academic librarians. *IFLA Journal*, *43*(1), 65–80. https://doi.org/10.1177/0340035216678237.

Corrall, S., Kennan, M. A., & Afzal, W. (2013). Bibliometrics and research data management services: Emerging trends in library support for research. *Library Trends*, *61*(3), 636–674. https://doi.org/10.1353/lib.2013.0005.

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. https://doi.org/10.1002/asi.23781.

Cox, A. M., Kennan, M. A., Lyon, L., Pinfield, S., & Sbaffi, L. (2019). Maturing research data services and the transformation of academic libraries. *Journal of Documentation*, *75*(6), 1432–1462. https://doi.org/10.1108/JD-12-2018-0211.

Cox, A. M., & Pinfield, S. (2014). Research data management and libraries: Current activities and future priorities. *Journal of Librarianship and Information Science*, *46*(4), 299–316. https://doi.org/10.1177/0961000613492542.

Cox, A., Verbaan, E., & Sen, B. (2012). Upskilling liaison librarians for research data management. *Ariadne*, *(70)*, 1–12. https://www.ariadne.ac.uk/issue/70/cox-et-al/.

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Sage Publications.

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/10.5195/jmla.2018.306.

Frederick, A., & Run, Y. (2019). The role of academic libraries in research data management: A case in Ghanaian university libraries. *OALib*, *06*(03), 1–16. https://doi.org/10.4236/oalib.1105286.

Fuhr, J. (2022). Developing data services skills in academic libraries. *College & Research Libraries*, *83*(3), 474–502. https://doi.org/10.5860/crl.83.3.474.

Gansemer-Topf, A. M., McCloud, L. I., & Braxton, J. M. (2024). Defining the scholarship of teaching and learning (SoTL). *New Directions for Student Services*, *2024*(185), 9–17. https://doi.org/10.1002/ss.20502.

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough?: An experiment with data saturation and variability. *Field Methods, 18*(1), 59-82. https://doi.org/10.1177/1525822X05279903.

Harrison, R. (2018). The academic library and the research office: Providing scholarly communications support at Imperial College London-A Case Study. In *Collaboration and the Academic Library: Internal and External, Local and Regional, National and International* (pp. 143–150). Elsevier. https://doi.org/10.1016/B978-0-08-102084-5.00013-4.

Huber, M. T., & Morreale, S. M. (2002). Situating the scholarship of teaching and learning: A cross-disciplinary conversation. In M. T. Huber & S. M. Morreale (Eds.), *Introduction to disciplinary styles in the scholarship of teaching and learning: Exploring common ground* (pp. 25–45). American Association for Higher Education and The Carnegie Foundation for the Advancement of Teaching.

Hutchings, P., & Shulman, L. S. (1999). The scholarship of teaching: New elaborations, new developments. *Change: The Magazine of Higher Learning*, *31*(5), 10–15. https://doi.org/10.1080/00091389909604218.

Imam, M., Muhammad, M., Abba, M. A., & Ijiekhuamhen, P. O. (2021). Assessment of capacity building efforts of library and information professionals in university libraries in Nigeria. *Information Impact: Journal of Information and Knowledge Management*, *11*(4), 25–36. https://doi.org/10.4314/iijikm.v11i4.3.

Ismail, M. I., Abrizah, A., & Samsuddin, S. F. (2021). Mapping the knowledge domains of research data management: A co-occurrence analysis. *Reimagining Libraries for a Post-Pandemic World: Proceedings of the International 8th Conference on Libraries, Information and Society, ICoLIS 2021*. http://commonrepo.um.edu.my/12794/.

Joo, S., & Schmidt, G. M. (2021). Research data services from the perspective of academic librarians. *Digital Library Perspectives*, *37*(3), 242–256. https://doi.org/10.1108/DLP-10-2020-0106.

Kahn, P., Goodhew, P., Murphy, M., & Walsh, L. (2013). The scholarship of teaching and learning as collaborative working: A case study in shared practice and collective purpose. *Higher Education Research and Development*, *32*(6), 901–914. https://doi.org/10.1080/07294360.2013.806439.

Karabenick, S. A., & Conley, A. (2011). Teacher motivation for professional development. *National Science Foundation*, 1–33.

Kennan, M. A. (2016). Data management: Knowledge and skills required in research, scientific and technical organisations. *Ifla*, 1–10. http://library.ifla.org/1466/1/221-kennan-en.pdf.

Kennan, M. A., Corrall, S., & Afzal, W. (2014). "Making space" in practice and education: research support services in academic libraries. *Library Management*, *35*(8/9), 666–683. https://doi.org/10.1108/LM-03-2014-0037.

Kenny, N., Popovic, C., McSweeney, J., Knorr, K., Hoessler, C., Hall, S., Fujita, N., El Khoury, E., & Khoury, E. El. (2017). Drawing on the principles of SoTL to illuminate a path forward for the scholarship of educational development. *The Canadian Journal for the Scholarship of Teaching and Learning*, *8*(2). https://doi.org/10.5206/cjsotl-rcacea.2017.2.10.

Kotarski, R., Reilly, S., Schrimpf, S., Smit, E., Walshe, K., Library, B., Bibliotheek, K., Informationstechnik, D. N., & House, P. (2012). *Eport on best practices for citability of data and on evolving roles in scholarly communication 21 June*.

Latham, B. (2017). Research data management: Defining roles, prioritizing services, and enumerating challenges. *The Journal of Academic Librarianship*, *43*(3), 263–265. https://doi.org/10.1016/j.acalib.2017.04.004.

Lavoie, B. (2022). *Library collaboration as a strategic choice: Evaluating options for acquiring capacity* (Issue August). https://doi.org/10.25333/mt16-0c57.

Leong, J. (2014). Purpose-driven learning for library staff. *Australian Library Journal*, *63*(2), 108–117. https://doi.org/10.1080/00049670.2014.898236.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic Inquiry.* Sage Publications.

Lyon, L. (2016). Librarians in the lab: Towards radically re-engineering data curation services at the research coalface. *New Review of Academic Librarianship*, *22*(4), 391–409. https://doi.org/10.1080/13614533.2016.1159969.

Malaysia Open Science Platform. (2020a). *MOSP Data Lifecycle*. https://www.akademisains.gov.my/mosp/mosp-data-lifecycle/.

Malaysia Open Science Platform. (2020b). *What is Malaysia Open Science Platform?* https://www.akademisains.gov.my/mosp/about/what-is-malaysia-open-science-platform/.

McKinney, K. (2007). Enhancing learning through the scholarship of teaching and learning: The challenges and joys of juggling. In *The Challenges and Joys of Juggling*. https://doi.org/10.1017/CBO9781107415324.004.

McNiff, L., & Hays, L. (2017). SoTL in the LIS classroom: Helping future academic librarians become more engaged teachers. *Communications in Information Literacy*, *11*(2), 366–377. https://doi.org/10.15760/comminfolit.2017.11.2.8.

Miles, M., & Huberman, A. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd ed.). https://b-ok.cc/book/874803/d61f85.

Mirhosseini, F., Mehrdad, N., Bigdeli, S., Peyrovi, H., & Khoddam, H. (2018). Exploring the concept of scholarship of teaching and learning (SoTL): Concept analysis. *Medical Journal of the Islamic Republic of Iran*, *32*(1). https://doi.org/10.14196/mjiri.32.96.

Mitchell, L. N., & Mitchell, E. T. (2015). Using SoTL as a lens to reflect and explore for innovation in education and librarianship. *Technical Services Quarterly*, *32*(1), 46–58. https://doi.org/10.1080/07317131.2015.972876.

Mthembu, M., & Ocholla, D. (2022). Development strategies as catalysts for provision of the RDM services in the South African higher education institutions. *South African Journal of Libraries and Information Science*, *88*(1), 1–8. https://doi.org/10.7553/88-1-2127.

Nakaziba, S., & Ngulube, P. (2023). Continuing professional development strategies for digital transformation among academic librarians in Africa: A systematic review. *Journal of Librarianship and Information Science*. https://doi.org/10.1177/09610006231207659.

Nwabueze, A. U., & Anike, A. N. (2016). Mentoring strategies in use for professional development of librarians in South-East Federal university libraries. *Journal of Applied Information Science and Technology*, *9*(1), 182–208.

Nwofor, F. A., Chikaodi, H. C. I., & Nwaede, V. U. (2023). Capacity building for effective services delivery of library staff in Festus Aghagbo Nwako Library (FANL), Nnamdi Azikiwe University, Awka. *International Journal of Research and Innovation in Social Science*, *VII*(V), 1081–1098. https://doi.org/10.47772/IJRISS.2023.70584.

Ohaji, I. K., Chawner, B., & Yoong, P. (2019). The role of a data librarian in academic and research libraries. *Information Research: An International Electronic Journal*, *24*(4). https://informationr.net/ir/24-4/paper844.html.

Osborn, J. (2017). Librarians as teachers: Forming a learning and teaching community of practice. *Journal of the Australian Library and Information Association*, *66*(2), 162–169. https://doi.org/10.1080/24750158.2017.1328633.

Oyighan, D., & Dennis, E. E. (2016). Education and human capacity building in library and information science education. *International Journal of Advanced Research Foundation*, *3*(8), 17–20. www.ijarf.com.

Patterton, L., Bothma, T., & Van Deventer, M. (2018). From planning to practice: An action plan for the implementation of research data management services in resource-constrained institutions. *South African Journal of Libraries and Information Science*, *84*(2), 15–27. https://doi.org/10.7553/84-2-1761.

Perera, K. (2019). Build new workflows to support research: Academic librarians as teachers. *International Conference on Next Generation Libraries*. https://www.academia.edu/41360328/Building_New_Research_Workflows_Academic_Librarians_as_Teachers?uc-g-sw=88585449.

Perini, M. (2014). Enhancing collaboration through the scholarship of teaching and learning. *Collaborative Librarianship*, *6*(1), 52–55. https://doi.org/10.29087/2014.6.1.08.

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 and Information Science Research*, *40*(3–4), 173–183. https://doi.org/10.1016/j.lisr.2018.08.002.

Peters, C. (2017). *Upskilling academic librarians for data management services*. http://creativecommons.org/licenses/by/4.0.

Piracha, H. A., & Ameen, K. (2019). Policy and planning of research data management in university libraries of Pakistan. *Collection and Curation*, *38*(2), 39–44. https://doi.org/10.1108/CC-08-2018-0019.

Riyanto, S., Marlina, E., & Triasih, H. (2019). Librarian role in research library services in Indonesian Institute of Sciences. *Berkala Ilmu Perpustakaan Dan Informasi*, *15*(2), 201. https://doi.org/10.22146/bip.35200.

Rod, A. B. (2023). It takes a researcher to know a researcher: Academic librarian perspectives regarding skills and training for research data support in Canada. *Evidence Based Library and Information Practice*, *18*(2), 44–58. https://doi.org/10.18438/eblip30297.

Sadlapur, S., & Kamble, S. (2021). Development of capacity building through training program in LIS professionals: A case study. *AEGAEUM Journal*, *9*(2), 188–201.

Saka, K. A. (2020). Mentoring: A process for successful collaboration and capacity building for Library and Information Science (LIS) educators. In *Knowledge sharing and sustainable LIS education in Nigeria*. Zeh Communications Ltd.

Saldana, J. (2016). *The coding manual for qualitative researchers*. SAGE.

Saleem, Q. U. A., Ashiq, M., Ul, Q., & Saleem, A. (2020). The facts of continuing professional development for LIS professionals in Pakistan: a literature review. *Bottom Line*, *33*(3), 263–271. https://doi.org/10.1108/BL-02-2020-0013.

Samah, N. A., Yaacob, A., Hussain, R. M. R., Mohd Yusoff, N., Meng, N. Y., Othman, R., Abu Bakar, A., & Hin, L. C. (2016). Exploring the perception of Scholarship of Teaching and

Learning (SOTL) among the academics of Malaysian higher education institutions: Post training experiences. *Man in India*, *96*(1–2), 433–446.

Schmidt, B., & Shearer, K. (2016). Joint task force on librarians' competencies in support of e-research and scholarly communication librarians' competencies profile for research data management. *Positioning and Power in Academic Publishing: Players, Agents and Agendas. Proceedings of the 20th International Conference on Electronic Publishing*, *June*, 1–7. https://www.coar-repositories.org/files/Competencies-for-RDM_June-2016.pdf%0Ahttp://ebooks.iospress.nl/publication/42887.

Semeler, A. R., Pinto, A. L., & Rozados, H. B. F. (2019). Data science in data librarianship: Core competencies of a data librarian. *Journal of Librarianship and Information Science*, *51*(3), 771–780. https://doi.org/10.1177/0961000617742465.

Shelly, M., & Jackson, M. (2018). Research data management compliance: is there a bigger role for university libraries? *Journal of the Australian Library and Information Association*, *67*(4), 394–410. https://doi.org/10.1080/24750158.2018.1536690.

Shipman, J. P., & Tang, R. (2019). The collaborative creation of a Research Data Management Librarian Academy (RDMLA). *Information Services & Use*, *39*(3), 243–247. https://doi.org/10.3233/ISU-190050.

Si, L., Zeng, Y., Guo, S., & Zhuang, X. (2019). Investigation and analysis of research support services in academic libraries. *Electronic Library*, *37*(2), 281–301. https://doi.org/10.1108/EL-06-2018-0125.

Simons, N., & Searle, S. (2014). Redefining 'the librarian' in the context of emerging eResearch services. *17th Biennial Conference and Exhibition*. http://www.vala.org.au/direct-download/vala2014-proceedings/479-vala2014-session-15-simons-paper/file.

Tammaro, A. M., & Casarosa, V. (2014). Research data management in the curriculum: An interdisciplinary approach. In T. Catarci, M. Agosti, & F. Esposito (Eds.), *Procedia Computer Science* (Vol. 38, Issue C, pp. 138–142). Elsevier B.V. https://doi.org/10.1016/j.procs.2014.10.023.

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. https://doi.org/10.2478/dim-2019-0009.

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. *Proceedings of the Association for Information Science and Technology*, *53*(1), 1–6. https://doi.org/10.1002/pra2.2016.14505301129.

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

Tinuoye, G. O. O., Omeluzor, S. U., & Akpojotor, L. O. (2016). Factors influencing job satisfaction of academic librarians in university libraries in Edo and Delta states, Nigeria. *Electronic Library*, *34*(6), 985–996. https://doi.org/10.1108/EL-07-2015-0128.

Tsekea, S. (2021). Capacity building for library and information science professionals in university libraries. *Examining the Impact of Industry 4.0 on Academic Libraries*, 217–225. https://doi.org/10.1108/978-1-80043-656-520201024/FULL/XML.

Walter, S. (2006). Instructional improvement: Building capacity for the professional development of librarians as teachers. *Reference & User Services Quarterly*, *45*(3), 213–218.

Xu, Z. (2022). Research data management practice in academic libraries. *Journal of Librarianship and Scholarly Communication, 10* (1). https://doi.org/ 10.31274/jlsc.13700.

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

Zhang, L., & Eichmann-Kalwara, N. (2019). Mapping the scholarly literature found in Scopus on research data management: A bibliometric and data visualization approach. *Journal of Librarianship and Scholarly Communication*, *7*(1). https://doi.org/10.7710/2162-3309.2266.

APPENDIX

Institution	
Institution code	
Interviewee	
Interviewee code	
Position	
Grade	
Division/Unit	
Date	
Time	
URL Google Meet	

Introduction

First of all, thank you for taking the time to talk to me today and agreeing to help me with this research study. My name is MOHD IKHWAN ISMAIL, and I am here to talk to you about your experiences, thoughts and opinions on research data management activities and services in your institutions. The interview should take 45 to 60 minutes.

Let me give you an outline of what is going to happen. I am going to ask you a series of questions. I want to understand things from your perspective. It is important to highlight that this is not a test. There are no right or wrong answers to any of the questions. I would like to ask you to be as honest as possible. Please speak freely.

We treat this conversation as strictly confidential. We will not share any details with anyone outside the immediate people working on this project.

With your permission, I would like to record this interview session. The recording will only be used to help us in our research, and it will not be shared with anyone except those with a need-to-know. Recording this interview session also helps me because I do not have to take as many notes during this session.

I have already prepared a participant's information sheet and informed consent form for you to review and sign. If you have not already, please sign it and send it back at your earliest convenience.

Questions

Training is very important in building our capacity to obtain, improve and retain our skills and knowledge.

- Have you received any specific training in RDM?
- What training do you receive?
- Who offers the training?
- How do you get involved in the said training? Who encourages you to participate in the training programme?
- Can you tell me the details about the training programme?
- What value did you get out of the content knowledge (modules) of the training programme?

You mentioned earlier that you participated in the RDM training, and in the end, you became a trainer and will train the researchers about the RDM.

- Are you ready to conduct the training for the researchers?
- What do you foresee from the researcher's view of the RDM training?

When providing RDM services to the researchers, it is very important to obtain and improve the librarian skills and knowledge simultaneously, especially in RDM.

- What benefits do you get from providing data management services/helping researchers manage their data?
- Is there a need to upskill the librarians in RDM, especially in engaging the researchers with RDM services?

One of the most important RDM services that engage the researchers is the training programme. Indeed, the training programme could be the platform for librarians to develop their capacity in RDM.

• Do you provide any training programmes for researchers about RDM? • What do you provide in the training of RDM to your researchers? • How do you train your researchers? • What is your strategy in training the researchers about RDM? • What do you think about the librarians training the researchers as an approach to better engage the researchers in RDM activities? • How does building the capacity in RDM services differ from building the capacity to engage the researchers in RDM?
Evaluation is an important element in capacity development to ensure that librarians can improve and retain their skills and knowledge about RDM. The learning from the activities and service delivery will be part of this development. • How do you evaluate yourself/the library in delivering the RDM services to the researchers? • How do you improve your capacity after the evaluation? • Do you share your capacity (skills and knowledge) with your colleagues after learning the new skills and knowledge? • How do you do that?
Conclusions and wrap-up
Before we wrap things up and talk about the next steps, do you have any last comments regarding this area of research?
Would you be open to speaking with me again in the future? Who else should I talk to regarding this research study?
Thank you for your participation.
Please do not hesitate to call or email should you think of additional areas that we should include or if you have any questions.