

Librarians' roles and responsibilities in managing data within academic libraries: A role-based data governance model

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ABSTRACT

The rapid growth of data-intensive research and digital transformation has significantly expanded the data management responsibilities of academic libraries. Academic librarians are increasingly expected to manage, curate and provide data to support institutional reporting, research activities and governance. However, their data-related roles remain unclear and inconsistently defined across institutions. Guided by two research questions, this study adopts a qualitative case study approach using semi-structured interviews with academic librarians from five research universities in Malaysia to examine how librarians' data-related roles are defined and structurally interconnected across the data lifecycle. The findings identify four interconnected roles: data curator, data provider, data custodian and coordinator. These roles form an integrated governance workflow rather than functioning in isolation, with librarians contributing to technical data management, institutional reporting, governance and strategic decision-making. The findings further demonstrate how data move across roles to support reporting, preservation and reuse. This study contributes by proposing a role-based data governance model that explain how data-related responsibilities are embedded and interconnected within academic library contexts, highlighting the need for stronger governance frameworks, integrated systems and continuous professional development.

Keywords: Data management; Data governance; Academic librarians; Institutional data; Data roles; Data governance model.

INTRODUCTION

The economic landscape is changing rapidly and becoming more complex. This change is driven by emerging technologies and high-tech innovations that support the growth of the digital economy. The digital economy refers to economic and social activities that involve the use of digital technologies by individuals, businesses and governments (*Malaysia Digital Economy Blueprint*, 2021). In Malaysia, this transformation was strengthened during the Twelfth Malaysia Plan (RMKe-12). Key initiatives included the establishment of the National Digital Economy and Fourth Industrial Revolution Council and the introduction of the

Malaysia Digital Economy Blueprint (MyDIGITAL). These initiatives aim to accelerate digitalisation and position data as a strategic economic asset (Ministry of Economy, 2021; *National Fourth Industrial Revolution Policy*, 2021; Rais Hussin Mohamed Ariff, 2021).

At the same time, the Fourth Industrial Revolution (IR 4.0) has led to the rapid generation of large volumes of data. This is driven by digitally enabled activities. As a result, reliance on data has increased across sectors, including higher education. In this context, the role of academic libraries has changed significantly. Libraries are no longer limited to managing bibliographic resources. They are now actively involved in managing research and institutional data. This shift is driven by technological developments, the rise of big data and the growth of data-intensive research (Luo & Tang, 2024; Semeler & Pinto, 2020; Strengell, 2017). Libraries are therefore expected to support data-driven research, institutional reporting and decision-making processes.

In response, research data management (RDM) and data services have become core areas of library practice, encompassing data curation, metadata management, repository services, bibliometric analysis and data sharing (Cox et al., 2017; Schmidt & Shearer, 2016; Mani et al., 2021; Bishop et al., 2022). As these services expand, librarians are increasingly involved in coordination, policy development and infrastructure support (Cox et al., 2019b; Schmidt et al., 2023). Despite these developments, librarians' data-related roles remain unclear and inconsistently defined. New titles such as data librarian, data curator and data scientist are used across institutions with overlapping or undefined responsibilities (Khan & Du, 2018; Semeler et al., 2017), often embedded within traditional roles and distributed across multiple units rather than formalised as distinct positions (Federer, 2018; Luo & Tang, 2024).

Academic libraries manage three categories of data relevant to this study, each differing in origin, purpose and institutional use. The first, research publication data, comprises bibliometric and publication metadata from databases such as Scopus and Web of Science, along with e-theses in institutional repositories, used to support national assessments such as MyRA, institutional reporting and academic performance evaluation. The second, research data, includes raw statistical datasets from agencies such as the Department of Statistics Malaysia (DoSM), managed through controlled-access data banks. Recent figures from the Malaysian Open Science Platform indicate that active research data repositories now exist across all five RUs, hosting between 12 and 1,469 datasets each (Malaysia Open Science Platform, 2026), indicating a shift from planning to implementation. The third, library and operational data, covers collection data, usage statistics, return on investment (ROI) data and service records used for budgeting, strategic planning and performance evaluation. Together, these categories reflect the shift from managing bibliographic resources to managing strategic institutional data assets, positioning academic libraries as active contributors to institutional governance rather than passive custodians of collections.

Despite growing recognition of librarians' involvement across the data lifecycle, their roles are often discussed at a conceptual level. Limited attention has been given to how distinct data-related roles are structurally interconnected within academic libraries, or how these roles function together as an integrated governance workflow (Corrall, 2012; Cox et al., 2019b; Ho et al., 2025; Pratama, 2025). Prior research outlines services, competencies and lifecycle functions but offers limited explanation of how responsibilities are structured into distinct yet interconnected roles. As data practices become more complex, the boundaries between librarian, analyst and data manager are increasingly blurred, with little empirical evidence showing how overlapping functions are coordinated within institutional workflows, particularly in Malaysian research universities.

To address these gaps, this study examines the roles and key responsibilities of academic librarians in managing data within academic libraries. It is guided by two research questions:

- i. What specific roles and responsibilities do academic librarians undertake in managing data within higher education institutions?
- ii. How are these roles functionally and structurally interconnected within academic library data management ecosystems?

This study contributes by conceptualising librarians' data roles as a role-integrated governance workflow, offering a structured model that explains how data-related responsibilities are embedded and interconnected within academic library contexts.

LITERATURE REVIEW

The rise of big data has significantly reshaped academic library roles. Libraries are increasingly involved in handling large volumes of research and institutional data, moving beyond bibliographic resources. This shift has produced new role labels: data librarian, data curator, data steward and data scientist, which remain inconsistently defined across institutions (Khan & Du, 2018; Semeler et al., 2017). The growth of data librarianship is linked to wider technological developments, including exponential data generation, the rise of data-intensive research and changing information environments (Strengell, 2017; Luo & Tang, 2024; Semeler & Pinto; 2020). Data scientists are distinguished by their ability to apply statistical and computational knowledge to generate new data products (Semeler et al., 2017), while Zhan and Widén (2017) highlight the potential of data reuse in generating new insights. As a result, libraries are increasingly expected to engage in data-intensive activities that support research and institutional performance.

RDM is widely recognised as a core library responsibility. Schmidt and Shearer (2016) identify key roles including data access provision, metadata management and repository services, positioning librarians as facilitators across the research lifecycle. Schmidt et al. (2023), further show that libraries provide RDM infrastructure supporting data curation, sharing and reproducibility, while promoting FAIR (Findable, Accessible, Interoperable and Reusable) and open science practices. Cox et al. (2017) conceptualise librarians' work through research data services including planning, training and advisory support, with maturation leading to greater involvement in institutional coordination and policy development (Cox et al., 2019b). Igbinovia et al. (2025) extend this, emphasising that effective RDM spans planning, storage, security, sharing and reuse. Librarians also contribute to bibliometric analysis, data visualisation and research evaluation (Mani et al., 2021), and routinely review data management plans, manage repositories and deliver RDM training (Bishop et al., 2022).

Despite the emergence of specialised titles, most data work in libraries remains embedded within traditional roles. Libraries continue to rely on existing positions such as research and reference librarians (Kellam & Thompson, 2016), with data services delivered as part of broader responsibilities rather than as standalone roles (Federer, 2018). Data-related tasks are distributed across multiple units including cataloguing, systems and research support (Luo & Tang, 2024; Schmidt et al., 2023). This embedded approach reflects a strong service orientation: librarians' competencies derive from practical responsibilities such as repository management, compliance support and training (Ohaji, 2016), and libraries directly engage with researchers through support, infrastructure and training (Schmidt et al., 2023). Collaboration is also central, with technical skills applied to support institutional research

activities rather than as independent goals (Rabasa & Abrizah, 2022; Ismail et al., 2024), and libraries closely connected with stakeholders such as IT and research services (Schmidt et al., 2023).

Librarians play an important role in data governance, quality and sustainability. Corral (2012) and Cox (2018) emphasise responsibilities related to policy compliance, metadata standards and data stewardship. Librarians contribute to governance frameworks, maintain data quality through metadata and documentation practices, and support long-term preservation and reuse (Ashiq et al., 2021; Bishop et al., 2022; Dube, 2025; Ho et al., 2025; Zainal et al., 2023; Cox et al., 2019b; Ismail et al., 2024; Laskowski, 2021; Ohaji, 2016; Rabasa & Abrizah, 2022). Internationally, Andrikopoulou et al. (2022) describe librarians as active participants in data governance and stewardship. In Malaysia, Ahmed & Othman (2021) and Amanullah & Abrizah (2023) show that repository management and open science practices are central to library services. However, governance activities are often discussed as part of broader RDM functions without clearly distinguishing specific custodial roles.

The literature increasingly recognises that data-related activities span the full research lifecycle, from creation and management to preservation and reuse (Ho et al., 2025; Cox et al., 2019b; Pratama, 2025; Zhan & Widén, 2017). Schmidt et al. (2023) demonstrate that libraries provide support and infrastructure across multiple stages of research and scholarly communication, while Luo and Tang (2024) show that data work is distributed across units, suggesting an interconnected system of activities. However, while the lifecycle concept is well established, the literature provides limited explanation of how roles interact within it. Most studies describe processes or services without clearly showing how responsibilities are structured across roles or how data flows between them in practice, a gap this study addresses.

METHOD

This study adopts a qualitative case study design (Creswell & Creswell, 2018; Yin, 2014) to examine how academic librarians understand, perform and interpret their data-related roles within institutional settings. A qualitative approach is appropriate as the study explores librarians' roles and responsibilities in managing data. This study was conducted across all five Malaysian public Research Universities (RUs): Universiti Malaya, Universiti Sains Malaysia, Universiti Kebangsaan Malaysia, Universiti Putra Malaysia and Universiti Teknologi Malaysia, designated by the Ministry of Higher Education (MOHE). RUs lead the national research agenda and host the most developed research data infrastructures and institutional repositories in Malaysia, making them information-rich cases (Patton, 2015) for this study. Covering the full population of Malaysian RUs reduces institutional selection bias and supports cross-case comparison. While sharing a common policy designation, the five RUs differ in disciplinary orientation but follow a similar structural approach to data management, with dedicated units handling research and publication data across all five institutions. Institutional profiles are summarised in Table 1.

Within each RU, purposive sampling was used to identify academic librarians whose responsibilities included at least one of the following: managing institutional repositories, research data, research publication data, library data, or related areas such as data services, RDM and open science. All participants provided informed consent prior to participation, in line with established qualitative research ethics (Creswell & Creswell, 2018). To ensure

confidentiality, participants and institutions were coded. Table 2 presents the participants' demographic and professional profiles, including their roles and years of experience.

Table 1: Institutional profiles of the RUs

Code	Institutional focus	Participants
RU1	Comprehensive; covers medicine, science, engineering, technology, social sciences and humanities	4
RU2	Comprehensive; strengths in science, social sciences, humanities and medical sciences	3
RU3	Multidisciplinary; strengths in agriculture, engineering and life sciences	7
RU4	Comprehensive; strong in applied and market-driven research	5
RU5	Focused on engineering and technology	3

Data were collected through semi-structured interviews. The interviews explored data-related practices, including data types, sources, formats and volume, as well as key processes such as data collection, organisation, documentation, quality control, storage, preservation and dissemination. Participants were also asked about institutional systems, policies, standards and ethical considerations, including data security, access control and handling of sensitive data. In addition, the interviews examined librarians' roles in supporting institutional functions such as reporting, data-driven decision-making and service provision. Data were analysed thematically using a hybrid deductive-inductive approach (Braun & Clarke, 2006; Creswell & Creswell, 2018; Elo & Kyngas, 2008; Sung, 2019). Coding was supported by CAQDAS (ATLAS.ti version 25), which facilitated data organisation and management. Themes were developed iteratively to identify patterns across the data.

Trustworthiness was ensured through triangulation across participants from different library units, enabling comparison of perspectives. The analysis was iterative, with themes refined across stages to enhance consistency and credibility. The use of a hybrid deductive-inductive approach and CAQDAS supported systematic coding and strengthened the dependability of the findings.

RESULTS

i. Librarians' roles and responsibilities in data management

This study identified four interconnected roles performed by academic librarians in managing data: Data Curator, Data Provider, Data Custodian, and Coordinator. These roles operate across the data lifecycle and support institutional reporting, research activities, and library operations. Together, these roles illustrate how librarians contribute both operationally and strategically to institutional data practices. Table 3 below summarises the roles and responsibilities of the various librarians in the data management process.

Table 2: Profile information of the participants

Participants	Gender	Job post	Types of data managed	Years of experience
RU1A	Female	Senior Librarian	Research publication data	6 years
RU1B	Female	Librarian	Research publication data	4 years
RU1C	Female	Senior Librarian	Research publication data	17 years
RU1D	Female	Senior Librarian,	Research publication data	22 years
RU2A	Female	Senior Librarian	Research publication data	13 years
RU2B	Female	Senior Librarian	Research publication data, library data	10 years
RU2C	Female	Assistant Chief Librarian	Research publication data	15 years
RU3A	Male	Assistant Chief Librarian	Research publication data, library data	11 years
RU3B	Female	Assistant Chief Librarian	Research publication data, library data	30 years
RU3C	Female	Senior Librarian	Research publication data, research data	3 years
RU3D	Female	Deputy Chief Librarian	Research publication data	20 years
RU3E	Female	Assistant Chief Librarian	Library data	23 years
RU3F	Female	Assistant Chief Librarian	Library data	24 years
RU3G	Female	Senior Librarian	Research publication data, library data	27 years
RU4A	Male	Senior Librarian	Library data	14 years
RU4B	Male	Senior Librarian	Research publication data, library data	12 years
RU4C	Female	Senior Librarian	Research publication data, library data	15 years
RU4D	Male	Senior Librarian	Research publication data	12 years
RU4E	Female	Senior Librarian	Research publication data	10 years
RU5A	Female	Senior Librarian	Research publication data, library data	12 years
RU5B	Male	Deputy Chief Librarian	Research publication data, library data	20 years
RU5C	Female	Senior Librarian	Research publication data, library data	13 years

Table 3: Summary of roles and responsibilities

Role	Responsibilities
Data curator	<ul style="list-style-type: none"> Managing and curating research publication data and library data Involved in the data management processes which is grouped into three: Data preparation, Data transformation & insights, Data stewardship
Data provider	<ul style="list-style-type: none"> Data compilation for reporting purposes Data services for research and development
Data custodian	<ul style="list-style-type: none"> Responsible for managing and safeguarding the data assets
Coordinator	<ul style="list-style-type: none"> Coordinating data among library departments or divisions Maintaining metadata in the library system Bridging data between library users and internal systems

Data curator: managing the data lifecycle

In this study, the data curator manages research publication data and library data throughout the data lifecycle. This role involves three integrated processes that form a continuous workflow: data preparation, transformation and analysis, and stewardship (Figure 1).

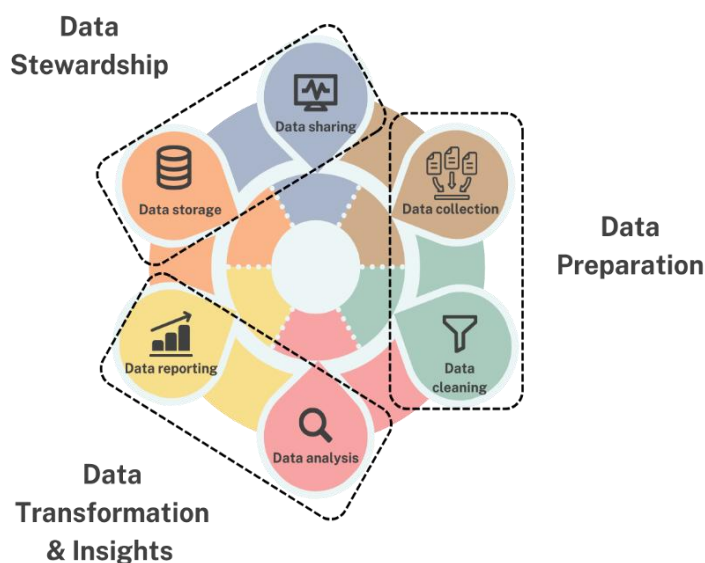


Figure 1: Data curation workflow across the data lifecycle

Librarians collect data from multiple sources and verify it with stakeholders, confirming that data validation is a shared process led by the library. As RU2B (paragraph 190) explained:

“...there is a checking process at the department level... the library will carry out the final checking to make sure everything is correct...” – paragraph 190 in RU2B.

Data cleaning involves correcting errors, standardising formats, and removing duplicates across systems. Both automated tools and manual verification are required, as stated by RU4E (paragraph 79). *“...we check for duplicates using conditional formatting... then we also do manual checking...” – paragraph 79 in RU4E.*

The findings reveal varying levels of management intensity in data cleaning across RUs. Automated tools such as Excel's conditional formatting support initial duplicate detection. However, manual verification remains essential, particularly when inconsistencies arise across systems. For example, special characters such as 'β' are represented differently in Web of Science and Scopus, with the former using the symbol and the latter spelling it out as 'B-E-T-A' (RU4E, paragraph 193).

"...we sort A to Z. They have to check. Especially for the symbol, like β: in Web of Science, it uses the symbol β. In Scopus, it spells out B-E-T-A..." – paragraph 193 in RU4E.

This combination of automated and manual processes is time-consuming and often requires additional staff support for large datasets (RU1C, paragraph 232). It highlights the gap between available tools and the need for more integrated and automated data management solutions.

"...for MyRA, when we download from Scopus, there is a lot of cleaning to be done... there are more than thousands of authors, so library staff usually help us clean the data..." – paragraph 232 in RU1C.

After preparation, librarians transform data into meaningful outputs through analysis and reporting: analysing publication trends, bibliometric indicators, and usage data to identify research strengths, evaluate resource usage, and inform institutional planning and performance evaluation.

"...we collect data from the past three to five years so we can compare each year in terms of usage and ROI..." – paragraph 241 in RU3E.

Reporting is a key outcome of this process, in which analysed data is translated into structured outputs for stakeholders. These reports are used for institutional monitoring, evaluation, and national assessments such as the MyRA. As RU1A (paragraph 519) noted:

"...the research data that we analyse is reported to the university management, to the VC (Vice Chancellor) and the TNC (Deputy Vice Chancellor) of research every month..." – paragraph 519 in RU1A.

Reporting practices are both scheduled and demand-driven, reflecting the continuous and responsive nature of data work within institutional contexts. Librarians expressed awareness of more advanced visualisation tools such as Power BI, though adoption remains constrained by budget and hardware limitations (RU4D, paragraph 501).

"...these software tools require a significant budget. Anything related to data, including visualisation tools such as Power BI, demands a substantial budget for subscription ..." – paragraph 501 in RU4D.

Data stewardship focuses on storage, preservation, and controlled sharing. Storage arrangements varied across RUs and data types, with most using dedicated institutional repositories for research publication data. Approaches differed in their specificity: RU1, for instance, maintains separate repositories for student theses and faculty outputs, while RU5 classifies repository access into Open, Restricted, and Preserve levels based on the sensitivity of stored materials (RU5A, paragraph 165).

"...we have a tiered repository system with three categories: Open, Restricted, and Preserve... theses, however, are stored either in the Restricted or Preserve Repository... these are highly confidential..." – paragraph 165 in RU5A.

Beyond institutional repositories, storage practices varied further within institutions, with librarians drawing on a mix of cloud platforms, local drives, and library management systems. This hybrid approach reflects the absence of a unified storage standard across RUs.

Standardisation gaps also reflect ongoing platform transitions across RUs. Several RUs are migrating from commercial to open-source library management systems, driven primarily by budget constraints, though such transitions require substantial migration and fine-tuning effort from librarians. Similarly, some RUs are transitioning from ePrints to DSpace for repository management due to concerns over long-term platform viability and support.

"...we have already maximised the capacity and upgrades of ePrints...ePrints was quite glorified, and every university library, including ours, used ePrints. However, ePrints has now stopped releasing new versions and no longer provides upgrades..." – paragraph 333 in RU4C.

Together, these transitions highlight that platform diversity, and migration efforts contribute significantly to the standardisation gaps identified in this study.

Data provider: supplying institutional and research data

As data providers, librarians supply curated data to support institutional reporting, evaluation and research activities. This role focuses on two main functions: data compilation for reporting and the provision of data services for research and development. Rather than producing raw data, librarians transform curated datasets into usable outputs for institutional and external stakeholders.

Librarians play a central role in institutional reporting processes, particularly in supporting national systems such as MyRA and other evaluation frameworks. These responsibilities require continuous preparation and validation of research publication data, reflecting the library's role in institutional accountability (RU1D, paragraph 54; RU3A, paragraph 63).

"...we also provide the statistics to MOHE...as well as to PNM (National Library of Malaysia)..." – paragraph 54 in RU1D.

"...she is also in charge of supplying data for MyRA, because there is a library component in that section..." – paragraph 63 in RU3A.

Reporting activities are both routine and demand-driven. Librarians produce scheduled reports for institutional monitoring while also responding to ad hoc requests from management, research units and faculties. These requests often require tailored outputs based on specific institutional needs (RU1A, paragraph 283).

"...some faculties... may need information on faculty publications... [they] might directly contact the librarian, to obtain that data..." – paragraph 283 in RU1A.

The findings show that reporting constitutes a substantial part of librarians' workload, highlighting the centrality of data provision within academic libraries (RU4C, paragraph 61).

“...it's like 90% of the time we have to be involved in data...” – paragraph 61 in RU4C.

It is important to note while this figure reflects one participant's estimate within their specific institutional context, it is not presented as a generalizable statistic. Rather, it illustrates the significant proportion of data-related work reported by librarians in data-intensive roles.

The same datasets are reused across multiple institutional functions, including reporting, benchmarking, performance evaluation and strategic planning. This reflects a feedback relationship between individual academic outputs and institutional performance, where validated data supports both internal decision-making and external assessment requirements.

Beyond reporting, librarians also provide access to specialised datasets, including raw data from external agencies and archival and special collections, to support research and development activities. Access is controlled to ensure compliance with institutional policies and ethical requirements (RU3C, paragraph 69).

“...we have raw data from the Department of Statistics Malaysia... If users want to use the data, they have to come to the library and apply. We provide the data in soft copy with controlled access...” – paragraph 69 in RU3C.

Figure 2 below illustrates the role and responsibilities of librarians as a data provider in this study.

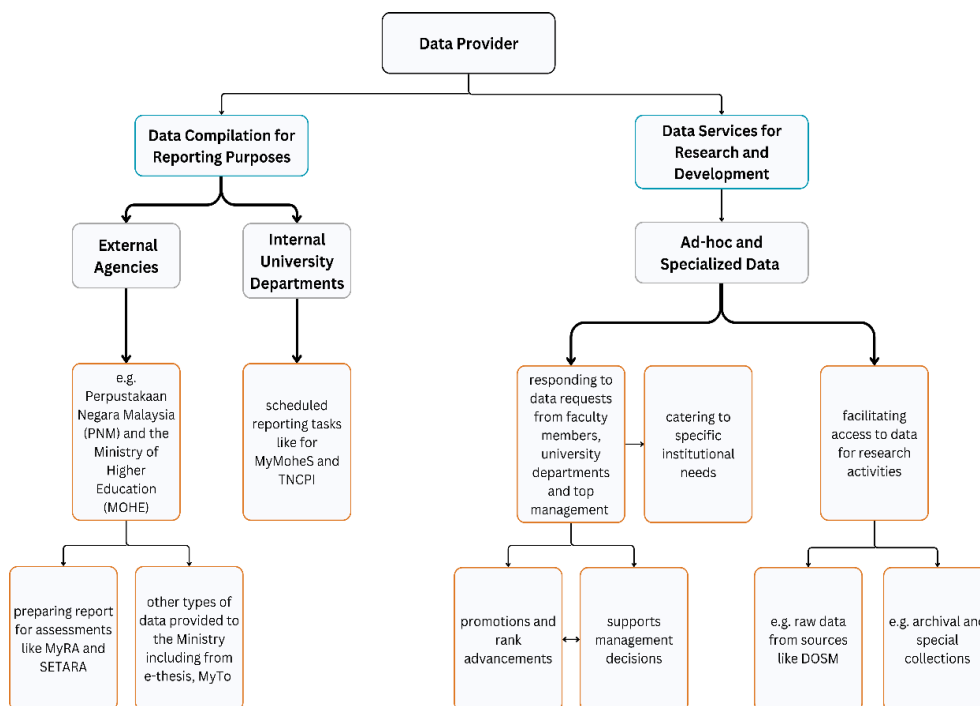


Figure 2: Role and responsibilities of librarians as a data provider

Data custodian: safeguarding data assets

As data custodians, librarians are responsible for managing, safeguarding and sustaining institutional data. Their role extends beyond technical storage to include governance, data

quality and long-term accessibility. Librarians act as custodians of institutional data systems, ensuring that data remains organised, accessible and secure over time. Figure 3 below illustrates the role and responsibilities of librarians as data custodians.

Librarians manage institutional repositories and related systems, overseeing content, metadata and user access while technical infrastructure is typically maintained by Information Communication and Technology (ICT) units (RU2B, paragraph 59).

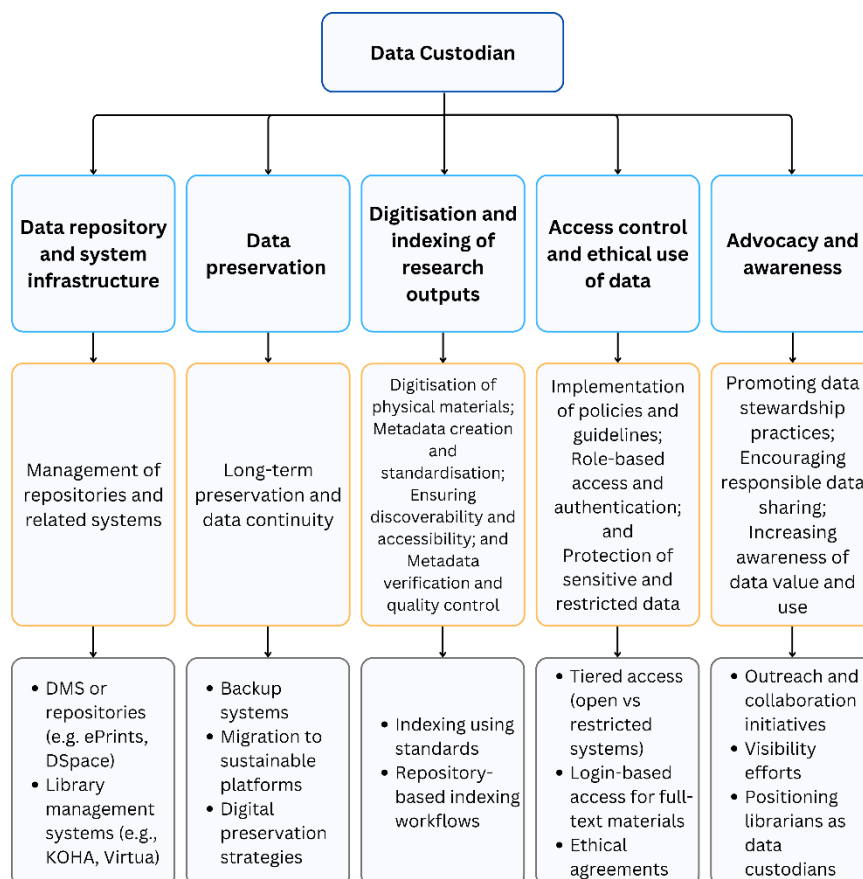


Figure 3: Role and responsibilities of librarians as a data custodian

“...the work is actually more focused on managing the institutional repository itself... which was developed by the ICT, but the owner is the library...” – paragraph 59 in RU2B

A key aspect of custodianship is ensuring long-term preservation and sustainability. Librarians maintain repositories, support system upgrades and manage data migration to ensure continued accessibility despite technological changes (RU5B, paragraph 176).

“...we use DSpace moving forward. We’ve already installed it, but we have not migrated the data yet...” – paragraph 176 in RU5B.

Librarians also organise and structure data to ensure accessibility and discoverability. This includes metadata management, standardisation and indexing practices aligned with recognised standards (RU4D, paragraph 56).

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“...we have to follow a specific standard in terms of metadata fields so that the system can index it... perfectly, completely and with proper linkage ...” – paragraph 56 in RU4D.

In addition to metadata management, custodianship involves digitising physical materials to enhance retrieval, preservation and integration across institutional platforms. As RU4D (paragraph 49) explained:

“...transforming physical items into digital format, especially anything related to research publications...” – paragraph 49 in RU4D.

Data governance is central to this role. Librarians implement policies, access controls and ethical guidelines to ensure responsible data use, with institutional systems applying tiered access and role-based permissions. However, the absence of unified data management policies means storage decisions are often made at unit level rather than institutionally, highlighting persistent governance gaps across institutional data infrastructures.

Librarians also promote responsible data stewardship through advocacy and outreach. They position themselves as data guardians who ensure preservation, accessibility and appropriate use of institutional data, as stated by RU5B (paragraph 389):

“...as a librarian, we are the data guardian. We guide the data. We save the data. We make sure it is preserved...” – paragraph 389 in RU5B.

Coordinator: integrating data workflows

As coordinators, librarians connect data activities across departments, systems and stakeholders. This role focuses on integrating data from multiple sources, ensuring consistency across workflows and facilitating collaboration within the institution. A key responsibility is integrating data from different library divisions and institutional units to produce unified outputs for reporting and analysis (RU4A, paragraph 90).

“...I collect data from the library system... and data from research support workshops... I gather all this data at the end of the year, compile it, and produce the annual report...” – paragraph 90 in RU4A.

Librarians verify and reconcile data from multiple sources to ensure completeness and consistency, particularly when datasets originate from different divisions as indicated by RU1D (paragraph 109):

“...for digital resources, we get the data from the acquisition division, and for usage, we get it from the client services division...” – paragraph 109 in RU1D.

Coordination also involves monitoring and quality control. Librarians identify inconsistencies, validate datasets and correct errors before data is used, as explained by RU3G (paragraph 743):

“...it should be five, but someone inputs six instead... we can go back and check the data...” – paragraph 743 in RU3G.

In addition, librarians facilitate collaboration across units and stakeholders by integrating contributions into shared outputs and platforms. For example, RU3B (paragraph 217)

described collaboration across systems, media and repository units to support university key performance indicators (KPIs).

"...we started with a landing page involving several departments in the library and the university. Each unit contributes content based on assigned topics, and we organise it into one platform to support visibility goals like Webometrics..." – paragraph 217 in RU3B

Librarians also act as intermediaries between users, systems and institutional processes, supporting access to data and resolving system-related issues (RU3A, paragraph 689).

"...we are just seen as intermediaries... middle persons between the library, the users and the system unit. For example, if there's a system issue or damage, we actually become the go-between as well..." – paragraph 689 in RU3A.

They also ensure that data and metadata meet required standards by verifying submissions and aligning outputs with institutional and national requirements (RU2B, paragraph 69).

"...we focus more on the metadata... where we ensure that what they submit is accurate and matches the provided evidence..." – paragraph 69 in RU2B.

Figure 4 below shows the roles and responsibilities of librarians as coordinators.

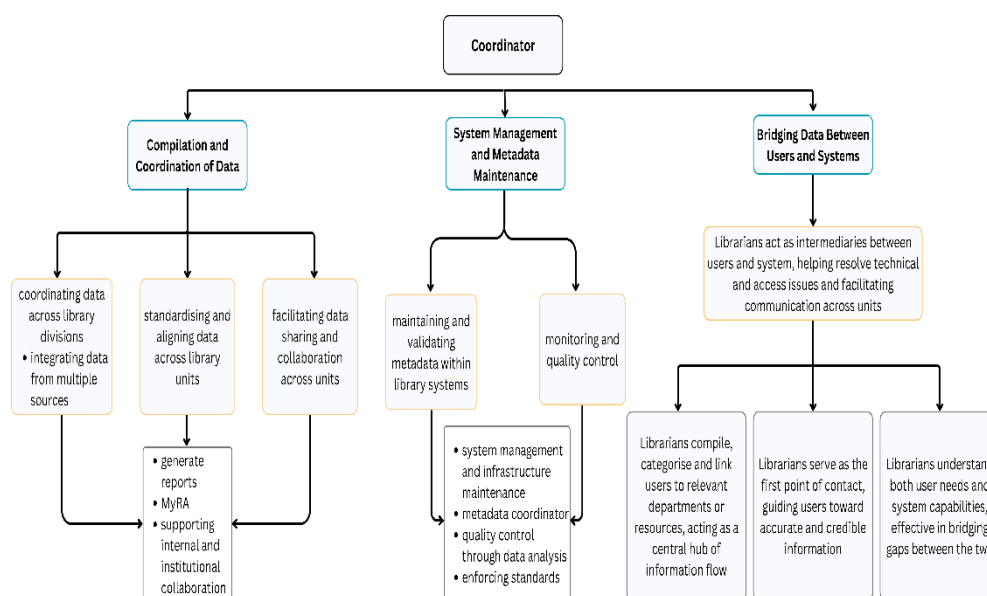


Figure 4: Role and responsibilities of librarians as a coordinator

ii. Interconnection of data roles in academic libraries

Figure 5 presents the role-based data governance model emerging from the findings, illustrating how the four roles are functionally and structurally interconnected. The findings show that these roles are not performed independently but operate as an integrated and continuous workflow, with data moving across roles through both linear progression and cyclical feedback loops.

Data curation serves as the foundation of this workflow. Through preparation, cleaning, standardisation and transformation, curated data becomes reliable and structured, forming the basis for both reporting and long-term preservation. Curated data flows into the data

data ecosystem, rather than merely a support unit. By identifying and clearly defining these roles, this study offers a more structured conceptualisation of librarians' data-related responsibilities, which have previously been described in fragmented ways.

The findings confirm that librarians play a central role throughout the data lifecycle. As data curators, they manage processes from data collection, cleaning, analysis, and reporting to storage and sharing. This supports earlier studies on RDM (Corrall, 2012; Cox et al., 2017; Pinfield et al., 2014; Tang & Hu, 2019). This study extends prior work by showing that librarians act as both technical operators and strategic enablers. They extract and clean data from sources such as Scopus and Web of Science, while also aligning outputs with institutional frameworks such as MyRA, KPIs, and university goals. This demonstrates that data curation is both technical and strategic.

Librarians' data analysis supports institutional decision-making. They identify research strengths, publication trends, and usage patterns. They also calculate ROI, justify budgets, and support benchmarking. Data curation involves ethical judgement, particularly in balancing open access with confidentiality. They apply embargoes, control access, and respect researchers' decisions on sensitive data. Consistent with Dube (2025), the findings show that RDM is not purely technical, but also organisational and collaborative. Librarians therefore act as knowledge architects who protect data integrity while enabling evidence-based decisions.

The study further shows that librarians act as strategic data providers. Their responsibilities extend beyond compiling records. They validate and standardise publication data that directly affect promotions, appraisals, and national assessments such as MyRA. In this role, librarians function as institutional data gatekeepers. They ensure that only verified and accurate outputs enter evaluation, ranking, and funding processes. Because validated research outputs influence academic career progression and research funding allocations, data accuracy carries significant institutional and individual consequences. This finding extends earlier studies (Ahmed & Othman, 2021; Amanullah & Abrizah, 2023) by demonstrating the extent of institutional reliance on librarians as authoritative stewards of research performance data. However, this expanded responsibility also increases workload pressures and requires continuous professional development. Universities therefore need to recognise and support librarians as key data partners.

The finding that data-related tasks constitute approximately 90% of some librarians' workloads (RU4C, paragraph 61) reflects their extensive involvement in institutional assessment and reporting across frameworks such as MyRA and SETARA, alongside emerging responsibilities in research data management. However, these responsibilities are carried out across fragmented, non-integrated systems requiring manual extraction, cleaning, and reconciliation across platforms. The absence of unified systems and standardised policies adds substantially to coordination and verification burdens, highlighting the need for institutional investment in integrated infrastructure and governance frameworks (Dube, 2025).

This study highlights a more active form of custodianship. Beyond storage, librarians digitise materials, manage infrastructure, ensure compliance, and support open science practices, aligning data management with frameworks such as MyRA, ISO standards, and open access mandates. While previous studies (Bishop et al., 2022; Pinfield et al., 2014) acknowledge preservation roles, the findings present custodianship here as policy-driven and governance-oriented, consistent with Schmidt et al. (2023). Through digitisation and structured indexing,

librarians enhance discoverability and ensure research outputs remain accessible and reusable. However, storage practices remain inconsistent across units, with mixed approaches creating fragmentation and risks of data loss (Ashiq et al., 2021; Dube, 2025), highlighting a persistent gap between awareness and implementation.

Similarly, the coordinator role connects departments, systems, and stakeholders. Librarians gather, validate, and standardise data across units to ensure consistency and support reporting requirements such as MyRA, while also collaborating with research offices for assessments, KPI tracking, and strategic initiatives. This aligns with Cox et al. (2017, 2019b) and Tang & Hu (2019), who describe librarians as facilitators and brokers. A key function is data quality control: verifying metadata, cleaning data, and enforcing standards before submission. While IT units manage infrastructure, librarians coordinate service-level functions, acting as knowledge orchestrators who connect people, systems, and data (Cox et al., 2019a, 2019b).

These findings have practical implications for how the role-based model maps onto existing departmental structures. In practice, librarians frequently enact multiple roles simultaneously within a single post. Librarians in Academic Service divisions, for example, perform curation functions while also acting as data providers for MyRA reporting. Those in Digital Resource Management simultaneously perform custodian and coordinator functions. This reflects the embedded and distributed nature of data work in academic libraries (Federer, 2018; Luo & Tang, 2024) and confirms that the proposed governance model is not a call for new positions, but a framework for recognising responsibilities already performed within existing roles.

Collectively, the findings show that data-related roles and responsibilities support institutional reporting and decision-making. Librarians prepare data for assessments, national audits, and internal reporting, including benchmarking and research evaluation. They produce both scheduled and customised reports. This aligns with prior studies highlighting librarians' involvement in institutional reporting and data services (Ahmed & Othman, 2021; Amanullah & Abrizah, 2023; Cox, 2018). Scheduled reports support routine monitoring, while customised reports address specific needs. Librarians respond to requests from management, research units, and academic staff. Accurate reporting depends on strong data curation, where verified data ensures reliability and supports institutional decisions. Data provision also connects external requirements, such as MyRA, with internal data needs.

These findings are consistent with previous studies linking librarians' data practices to institutional evaluation and decision-making. Luo and Tang (2024) demonstrate that analytics, curation, and visualisation enhance library assessment capabilities, while Laskowski (2021) and Shahzad et al. (2024) associate data practices with institutional analytics and decision support. Rabasa and Abrizah (2022) and Ismail et al. (2024) further emphasise librarians' roles in bibliometrics, metadata provision, and repository management, enabling structured, usable data for institutional purposes. Overall, librarians transform data into usable evidence for organisational decision-making.

Similarly, the findings indicate that the data custodian role supports governance, data quality, and long-term sustainability. Librarians manage repositories, digital collections, and metadata systems, ensuring compliance with institutional and national standards. They implement access control and authentication systems to protect sensitive data, manage embargoed materials, and enforce data sharing policies, supporting ethical data use. Strong

curation underpins custodianship. Standardised and verified data enable preservation and reuse, while governance practices build trust in institutional data systems. Librarians also preserve research outputs and institutional knowledge, ensuring long-term accessibility.

These findings are consistent with previous studies that position libraries as key actors in data governance and sustainability. Laskowski (2021) and Cox et al. (2019b) highlight librarians' roles in risk management, policy development, and compliance frameworks. Governance frameworks, lifecycle management, and data integrity are further emphasised by Hazmi et al. (2023) and Huang et al. (2020), while maintaining data quality through metadata standards and sustained infrastructure is recognised as a core function of librarianship (Bishop et al., 2022; Dube, 2025; Ho et al., 2025; Rod, 2023).

Collectively, these roles form a continuous and integrated workflow. Data curation serves as the starting point, enabling both reporting and preservation. Curated data flows into the data provider role for reporting and strategic use, while also supporting custodianship by enabling long-term storage and reuse. Preserved data is later reused for reporting, creating a continuous loop between roles. Coordination operates across all roles, with librarians connecting units, systems, and stakeholders to ensure consistency and alignment. This function is embedded in all activities. By explicitly conceptualising how data move across roles within institutional contexts, this study advances a workflow-oriented perspective and proposes a role-based data governance model for academic libraries, extending lifecycle-oriented arguments presented by Schmidt et al. (2023).

This integrated workflow aligns with previous studies that emphasise the continuous data lifecycle, including curation, preservation, and reuse, as well as the collaborative and interconnected nature of research data services (Cox, Pinfield & Rutter, 2019; Pratama, 2025). However, this study further extends existing literature by explicitly conceptualising the flow of data across roles, highlighting how curation initiates the workflow and how data move between roles through a continuous feedback loop between reuse and reporting within institutional contexts.

The findings reflect a clear shift in academic librarians' roles, from service providers to strategic data professionals supporting governance and institutional performance. They bridge data and decision-making, researchers and administrators, and openness and security, with their work supporting budgeting, KPI tracking, and strategic planning. This shift requires new competencies in metadata, analytics, policy compliance, data ethics, and systems, alongside continuous professional development. Previous studies (Cox, 2022; Cox, Pinfield & Rutter, 2019; Noh, 2015) confirm that libraries are increasingly adopting AI and related technologies, with librarians expected to complement rather than compete with these developments.

Additionally, to keep pace with evolving institutional demands, libraries need to move from manual task execution towards more automated workflows. Data cleaning, duplicate detection, and reporting currently rely heavily on manual intervention across disconnected platforms. Adoption of automated deduplication, metadata harvesting, and integrated repository management would reduce this burden, while dashboard tools such as Power BI could replace manual report compilation for real-time institutional decision-making. However, adoption remains constrained by budget limitations (RU4D, paragraph 501; Dube, 2025), aligning with broader calls for libraries to adopt data analytics technologies (Cox, 2022; Shahzad et al., 2024).

CONCLUSIONS

This study identified four functionally and structurally interconnected roles performed by academic librarians in managing data: data curator, data provider, data custodian, and coordinator. Rather than operating separately, these roles form a continuous and integrated workflow that supports data management, institutional reporting, and decision-making. The findings contribute to the literature by proposing a role-based data governance model that conceptualises librarians' data responsibilities as an integrated workflow, demonstrating not only how these roles are distinct and interconnected, but also how data flows across them from curation to reporting and preservation, and back through reuse. This extends existing research by clarifying the governance dimension embedded in librarians' data work and addressing the limited attention given to role interconnections in earlier studies.

The study also highlights the strategic importance of librarians in supporting institutional performance through evidence-based decision-making, national assessments such as MyRA, and improved institutional visibility and accountability. These findings reflect a shift from traditional service roles to more strategic and data-driven functions. Research data management in Malaysian research universities is progressing from planning to active implementation, with the growing number of research datasets across university repositories indicating an expanding operational role for librarians. However, challenges remain: data practices are fragmented, storage systems are inconsistent, and workloads are increasing, highlighting the need for stronger governance frameworks, integrated systems, and continuous professional development.

This study focuses exclusively on Malaysian public Research Universities, which have similar data management structures and MOHE policy frameworks. Findings may not be applicable to non-research universities, private institutions, or libraries in other countries with different governance models or levels of infrastructure maturity. The structural similarities among the five RUs may have limited the observed variation in role configurations. Future research could include other types of institutions or compare findings across countries. Further studies could also develop a competency framework for data librarians to support evolving roles in data-intensive environments. In conclusion, this study demonstrates that academic librarians play a critical and strategic role in managing institutional data. By conceptualising their responsibilities as an integrated governance workflow, this study provides a clearer foundation for understanding, strengthening, and sustaining data-related work in academic libraries.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest regarding the publication of this paper.

ETHICAL APPROVAL AND INFORMED CONSENT STATEMENTS

All participants provided informed consent prior to participation, and their confidentiality and anonymity were strictly maintained in accordance with relevant ethical guidelines.

AUTHOR CONTRIBUTION

Conceptualisation: [Amirah A.], Methodology: [all authors], Formal analysis and investigation: [all authors], Writing - original draft preparation: [Amirah A.]; Writing - review and editing: [all authors]

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