



Institutional policies for research data management: an analysis of Dutch university frameworks

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Abstract: This study analyses the normative content of institutional policies for research data management adopted by Dutch universities, aiming to identify their structural elements, management strategies, and degree of alignment with principles that ensure data findability, accessibility, interoperability, and reusability. The research is qualitative and exploratory in nature, based on systematic documentary analysis of formal and official sources from universities. The findings allowed mapping the frequency and distribution of common elements, as well as identifying conceptual and operational gaps. The results revealed the consolidation of a governance model articulated across national, European, and institutional levels, supported by the integration of digital infrastructures, specialised technical support, and clearly defined responsibilities. The analysed policies demonstrate strong adherence to the FAIR principles, reinforcing both the mandatory nature of data sharing and the ethical and legal responsibilities of institutions. However, weaknesses remain in areas such as metadata, data disposal, cost management, and terminological clarity. It is concluded that the Dutch model serves as a reference for the maturity of its practices and the balance achieved between data openness and protection. The results provide theoretical and practical insights for Brazilian universities to develop comprehensive policies aligned with international standards while remaining sensitive to local specificities, thus contributing to the institutionalisation of research data management and the strengthening of open science in Brazil.

Keywords: research data management; Brazilian universities; scientific data governance

1 From byproducts to protagonists: the rise of data

Over the past 25 years, sociocultural movements and technological advances have profoundly changed the scientific research ecosystem. At the same time, the growing intensity of collaborative research conducted on a global scale has introduced new challenges, concepts, and paradigms. The Open Access and Open Science movements not only redefine the methods of organising, processing, and disseminating scientific information but also challenge traditional models of knowledge production.

It is in this context that research data has gained centrality; recognition of its value has grown as funding agencies, governments, research institutions, and economic organisations begin to demand its management and sharing.

In addition to verifying integrity and quality, the benefits of data sharing are related to the possibility of reuse in other investigations, including in different fields. Data also plays a role as an asset of commercial value and as a model of environmental sustainability. It contributes to faster research results, cost reduction, and the protection of plant and animal species by avoiding new collections involving test subjects, natural resources, or materials that are difficult to handle, such as biological and radioactive substances. Furthermore, they strengthen citizen science practices, guaranteeing society the right to open access to scientific information.

In this context of democratising access, a principle strongly advocated by Information Science, open research data play a strategic role in addressing misinformation, fake news, and anti-science discourse. By enabling the public verification of data collection, generation, and processing methods, they promote greater transparency and trust in science. In the case of research funded by public resources, it represents a way of giving back to society. Furthermore, they expand the social impact of research by allowing governments, businesses, and citizens to use information for the development of public policies, technological solutions, and initiatives across diverse contexts. Open data also strengthen scientific ethics and enhances the visibility and recognition of authors through data reuse and citation.

However, the benefits of data sharing may be inversely proportional to the

risks inherent in data openness. In this context, Research Data Management (RDM) becomes essential to ensure the organisation, preservation, and responsible availability of data over time. Meeting both the right of access and the duty of protection requires coordinated action among specialised professional groups responsible for developing and operating tools, technological infrastructures, security systems, and decision-making strategies.

In response to these challenges, the scientific community and information professionals have intensified their efforts to study and implement practices guided by the FAIR Principles: ensuring that data are findable, accessible, interoperable, and reusable. Several research institutions have formulated RDM policies that encompass multiple dimensions, including: (a) the characteristics of data, such as type, risk classification, format, documentation, and metadata; (b) operational management techniques, such as planning, storage, assignment of persistent identifiers, licenses, life cycle management, and archiving; (c) technological infrastructure, including data centres, software, security systems, and communication protocols; and (d) legal frameworks, ethical considerations, and international agreements related to research, innovation, and knowledge transfer.

Nevertheless, the establishment of standards remains an ongoing process. The emerging nature of RDM within institutional contexts, combined with disciplinary diversity, challenges of system interoperability, the need to protect personal and sensitive data, and the complexities surrounding copyright and intellectual property continue to generate ethical and legal debates. These factors indicate that the formulation of RDM policies requires continuous efforts of adaptation, negotiation, and both national and international cooperation.

Despite the existence of RDM policies in international contexts such as Germany's National Research Data Infrastructure and the United States' National Institutes of Health (NIH), there remains a scarcity of studies that systematically analyse the content and structure of such policies within institutions that conduct research. This gap is particularly evident in the limited identification of common elements, the diversity of implementation strategies adopted, and the evaluation of their alignment with national and international normative frameworks.

In Brazil, universities are primarily responsible for scientific research and, consequently, the collection, generation, and processing of research data. However, few institutions offer data management services, and even fewer have established regulations to organise these practices. Furthermore, the instruments that do exist are in the early stages of development and offer less coverage than in regions of the world with which Brazil collaborates, where scientific research has a greater impact. This situation reveals significant gaps in the Brazilian context, undermining the efficiency, transparency, and potential for international integration of research, and demonstrating the urgent need for more robust, systematic institutional policies.

To identify the elements that encompass the multiple dimensions involved, this study will explore and analyse the content and structure of RDM policies already implemented in universities, offering support to Brazilian academic institutions in the development of more comprehensive policies aligned with international standards. Thus, the following research question is formulated: what elements should be included in institutional research data management policies at universities?

This study aims to analyse the normative content of institutional RDM policies adopted by Dutch universities, examining their structural elements, governance strategies, degree of alignment with FAIR principles, and the distribution of normative components, as well as conceptual and operational gaps and their implications, in order to provide support for the formulation and improvement of policies in Brazilian universities.

The selection of the Netherlands as an empirical case is justified by the country's international recognition in the consolidation of open science initiatives and the adoption of FAIR principles, supported by integrated national infrastructure and a culture of interinstitutional cooperation. As Santos (2017, p. 54) points out, "With its strong culture of cooperation and limited geographical size, the Netherlands is the ideal country to act as a leader and protagonist in this movement". Added to this is the articulation of support and coordination mechanisms at multiple levels, national public system, European Union, academic consortia, and programs for standardization and dissemination of good

practices, which gives the Dutch context analytical relevance for the identification of normative components, governance standards, and critical points capable of contributing to policy models applicable in Brazilian universities.

The study also mapped patterns, weaknesses, and particularities, and assessed the degree of alignment with the FAIR principles. Using this analytical framework, the study aimed to generate insights grounded in empirical research that could be adapted to the Brazilian context, where the institutionalisation of RDM is still in its early stages. The findings aim to refine national and institutional policies, aligning them with international standards and promoting the consolidation of RDM practices within the academic sphere.

2 Literature review

According to Torino, Roa-Martinez, and Vidotti (2020, p. 184), before its potential was recognised, research data sharing was “[...] often overlooked or relegated to a lower level of importance than scientific articles”; it was also considered a byproduct of research, often treated inadequately or neglected, and was ultimately lost or discarded (Sayao; Sales, 2014). Currently, actors from different spheres (scientific, economic, governmental, and civil society) recognise the strategic value of data, comparing it to a “new oil”, a “new gold” (Dijk; Doorn, 2014; The Economist, 2017). When an object (physical or digital) constitutes a commercially valuable asset, interests arise that focus on appropriation and monetisation, increasing the risks of improper access to and unethical use of data. This has become a growing concern among governments, international organisations, and civil society actors.

Despite the existence of legal frameworks covering personal data protection and copyright in several countries, data continues to be made available and commercialised without explicit authorisation from individuals or institutions (Borgman, 2018; Borgman; Bourne, 2022). The tension between availability and protection extends beyond the legal sphere to encompass the ethical commitment of research institutions to transparency and integrity in data management practices. As Sales (2014, p. 71) warns, “Access to data in the future will depend on how we balance all the overlapping variables”, emphasising the need for

coherent institutional policies and multisectoral governance that balance potentially conflicting interests between local norms and international regulations.

In the field of science, Wallis, Rolando, and Borgman (2013, p. 2) argue that “returns on investment” are possible only “if data are properly managed”. They position data as the “cornerstone of science” and justify this based on data’s ability to expand opportunities for reuse, combination, and acceleration of research. From this perspective, RDM is essential because it encompasses actions aimed at organising, storing, preserving, and sharing data generated, collected, and processed throughout the scientific research process (Chawinga; Zinn, 2019; Sales; Sayão, 2018). Thus, formulating institutional policies is fundamental to ensuring the consistency, sustainability, and continuity of these practices.

Document management for archival and bibliographic materials, whether physical or digital, is based on classification theories and knowledge organisation systems. These networks use technology and workflows based on widely established global standards. However, these methods are not suitable for research data because they are dynamic, heterogeneous, and often temporary. They are also limited to specific disciplinary contexts, requiring different approaches. Thus, the challenge of managing them while respecting these attributes emerged.

According to Sales *et al.* (2019), developing new methodologies, infrastructures, competencies, and workflows requires establishing new institutional cultures. Data management aligns with the interests of research institutions, the public sector, and the private sector, while addressing legal and ethical issues and the standards defined by data holders, who determine permitted access and reuse (Torino; Roa-Martínez; Vidotti, 2020). Sales and Sayão (2018) argue that management is fundamental because it involves responsibilities and skills throughout the process, as well as protection against the “misuse of data” and the need for standardisation.

The Digital Curation Centre (DCC) (2017¹, p. 74 *apud* Costa 2017), presents the elements of management planning: data collection; documentation and metadata; ethics and legal compliance; storage and backup; retention and preservation; data sharing; responsibilities and resources; and the life cycle. Sayão

and Sales (2015) add “data citation” to this list. Ethics and legal compliance refers to aspects such as copyright and property laws, treaties, and commitments related to research ethics and integrity (Costa, 2017). Each of these components involves a set of variables, strategic decisions, and specific tools that guide actions throughout the data lifecycle, which ranges from the development of the data management plan to its disposal.

One of the emerging challenges involves values and interests on a global scale. Data sharing is facing tensions stemming from cultural and legal diversity and the varied requirements of funding agencies (Sayão; Sales, 2014). According to Borgman and Bourne (2022, p. 15), internal challenges also arise in addition to international tensions, since “[...] attitudes, policies, and capacities for sharing vary within and among universities”. In light of this, the authors advocate “[...] thinking globally and acting locally” to promote aligning international standards with institutional interests and contexts (Borgman; Bourne, 2022, p. 15). Aligning procedures and infrastructure would enhance interoperability among institutions, avoiding redundant efforts and promoting scientific advancement (Henning *et al.*, 2019).

Inspired by the African proverb, “It takes a village to raise a child”, Borgman and Bourne (2022, p. 17) assert that data management and sharing transcend the individual level, necessitating the collaborative dedication of research institutions, governments, funding agencies, and other entities comprising the global scientific community. Within universities, the authors identify several co-responsible actors: individual researchers, principal investigators, department and faculty chairs, information technology (IT) services, libraries, and administrative leadership. They emphasise that each actor performs specific, interdependent, and essential functions for the effective implementation of RDM. Furthermore, they emphasise that establishing formal agreements and commitments is essential to ensuring standards that promote correspondence and reciprocity among institutions, thereby encouraging efficient data sharing and generating mutual benefits (Borgman; Bourne, 2022).

Costa and Cunha (2019, p. 293) report that “[...] when a research institution does not provide scientists with guidance on what can and cannot be

done with data, numerous doubts arise”. Traditionally, libraries have been sought as sources of support for issues related to information management and organisation. In this context, Huang, Cox, and Sbaffi (2020, p. 12) point out that “[...] it is difficult for the library to teach researchers how to handle their data without policies or requirements from funders or the university [...] Researchers tend to maintain their own ways of managing data [...] and do not have extra time to share”. This is a serious problem.

RDM was prompted by the requirements of funding agencies and politico-economic organisations, which contributed to the development of services and a cultural shift in scientific practices (Henning *et al.*, 2019). The Organisation for Economic Cooperation and Development (OECD, 2007, 2020) emphasises the importance of making research data openly available. This guideline was materialised in the EU through the Horizon 2020 programme, which funded projects focused on data management and open access. Since 2013, the NIH has encouraged RDM and, in 2023, released a more comprehensive policy on the subject. In the Netherlands, the primary funding agencies, namely the Netherlands Organisation for Scientific Research (NWO) and the Royal Netherlands Academy of Arts and Sciences (KNAW), advocate making research data “[...] as publicly accessible as possible” (Dillo; Doorn, 2014, p. 3), accelerating the adoption of practices.

The issue of collective efforts involves not only institutional stakeholders, but also broader, more complex levels, including international cooperation among nations to enable global data sharing (Borgman; Bourne, 2022; OECD, 2007, 2020; Sayão; Sales, 2015). In this context, the FAIR principles have become fundamental guidelines because they provide reference standards and internationally applicable tools (Henning *et al.*, 2019).

In 2014, the Netherlands implemented a federated infrastructure for RDM, designed to meet technical, technological, and institutional support demands. Coordinated initiatives were developed within universities (Ringersma, 2016), including a seminar held in 2016 by the National Coordination Point for Research Data Management (LCRDM), the Consortium of Dutch University Libraries, and the National Library of the Netherlands. This seminar focused on discussions

surrounding the formulation of RDM policies. During the event, there were three sessions: one on the current state of RDM policy, one on how RDM policymaking should respond to the Amsterdam Call for Action on Open Science, and one on incentives and the needs of researchers (Ringersma, 2016). Zeeland and Ringersma (2017) emphasise that, in the process of policy formulation, university libraries played a central role, either leading or supporting institutional initiatives. Additionally, “Data Management Support units” were established to provide specialised support for RDM practices within universities.

Zeeland and Ringersma (2017) described a participatory approach to formulating RDM policies at universities that involved consulting researchers, mapping existing infrastructure, identifying gaps, and engaging different sectors of the academic community. In their analysis of the experience at Leiden University, Schoots *et al.* (2017) reinforced these same aspects, emphasising the active involvement of researchers and the collection of concrete information to support the development of institutional regulations.

Costa and Cunha (2019) argue that data management policies should extend beyond technical aspects, such as infrastructure and metadata, by incorporating guidelines that promote data sharing, reuse, and academic recognition. From this perspective, Research Data Netherlands (RDNL) promotes coherent practices through initiatives like the Dutch Data Prize, which recognises researchers and teams that excel at promoting data sharing.

In light of emerging international trends, Brazilian universities are facing a new scientific paradigm requiring institutional and cultural adaptation. Although the Brazilian context has structural and financial limitations compared to the Dutch scenario, this process must be initiated in a planned and gradual manner, with careful consideration of local specifics.

3 Methodology

This study is qualitative in nature, with a documentary and exploratory design. The theoretical framework was constructed based on literature retrieved from the CAPES Journal Portal, SciELO, OasisBr, and Google Scholar databases. The searches were conducted using combinations of the following terms: research

data, research data management, sharing, data management plan, institutional policy(ies), and Netherlands. The same terms were also searched in Portuguese: dados de pesquisa, gestão de dados de pesquisa, compartilhamento, plano de gestão de dados, política(s) institucional(is), and Holanda. The documentary corpus prioritised the institutional RDM policies of Dutch universities that are members of the Universiteiten van Nederland Group, identified in Chart 1, which served as the primary sources for analysis. Data collection and document analysis were conducted between September 2023 and July 2025.

Chart 1 - Selected research universities

University	Title/year
University of Amsterdam	UvA Research Data Management (2024)
Vrije Amsterdam University	Research Data Management Policy (2024)
Leiden University	Research Data Management Regulations Leiden University (2021)
Utrecht University	University Policy Framework for Research Data (2019)
University of Groningen	UG Research Data Policy (2021)
Radboud University	Guidelines on Control of Research Data (2016)
Erasmus University Rotterdam	Research Data Management Policy of Erasmus University Rotterdam (2020).
Maastricht University	Research Data Management Code of Conduct (2024)
Delft University of Technology	TU Delft Research Data Framework Policy (2020)
University of Twente	Research Data Management Policy University of Twente (2025)
Tilburg University	Research Data Management Regulation (2020)
Wageningen University	Data Policy at WUR ([202-])

Source: Drawn up by the authors.

During the critical reading of the documents, the relevant elements and procedures were identified and recorded on individual extraction sheets for each university. The analytical categories were defined based on international references discussed in the literature consulted. In particular, the concepts and components proposed by the DCC, as discussed by Costa (2017) and Costa and Cunha (2019), as well as the elements associated with the operationalization of the FAIR principles, as addressed by Henning *et al.* (2019). In addition, an

inductive refinement was carried out based on the RDM policies analysed. Each spreadsheet followed a structure composed of two columns: the element and the description of the approach adopted, as illustrated in Chart 2.

Chart 2 - Organisation of the elements identified in each policy

Institution	
Element	Approach
Data steward	Yes
Local system for storage	Yes
Glossary	No
[...]	[...]

Source: Drawn up by the authors.

After analysing and recording data from each policy individually, the information in the spreadsheets was consolidated into an analytical matrix. The first column listed the elements, and subsequent columns represented each university, as shown in Chart 3.

Chart 3 - Organisation of the elements of all policies

Element	Unv. A	Unv. B	Unv. C	[...]
Data steward	Yes	Omitted	Yes	
Local system for storage	Yes	Yes	Omitted	
Glossary	No	Yes	Yes	
[...]				

Source: Drawn up by the authors.

This systematisation made it possible to map the frequency and distribution of elements among institutions, revealing predominant patterns as well as the specific approaches adopted by universities. Each document underwent qualitative content analysis and iterative coding to identify structural and thematic patterns that align with international standards and frameworks for RDM.

4 Results and discussion

The findings are presented hereinafter, based on an analysis of policy content and with insights derived from the bibliographic and documentary sources.

Policies should include guidelines on practices and tools designed to promote responsible access to research data and ensure ethical and legal compliance, as well as adherence to the FAIR principles. To make data findable, use persistent identifiers, suggest descriptive and structured metadata, and store data in certified repositories. Regarding accessibility, policies address situations to determine when data can be made available to the public and when it must be restricted. With respect to interoperability, the use of open file formats and their continuous updating was encouraged, especially given the rapid obsolescence of software and extensions. The use of standardised disciplinary metadata, recognised by the international scientific community, was also highlighted as a strategy to enable interoperability between systems, facilitate discovery, and promote data exchange.

Another relevant aspect for determining access and reuse levels is the attribution of licences (such as Creative Commons) indicating the permitted forms of use and redistribution defined by the data producers. Additionally, the policies emphasise the importance of preserving associated documentation, as it provides essential context for understanding how the data were collected, generated, and processed. In this regard, the Data Management Plan (DMP) should be considered an integral part of this documentation set.

The policies made it clear that the FAIR principles were an institutional goal. The universities stated that all researchers must share their data unless there are legal, ethical, or contractual impediments. However, such restrictions do not eliminate the obligation to manage data and keep it restricted while publishing its metadata in repositories. Nevertheless, the results also revealed challenges related to the practical implementation of these principles.

It was found that RDM policies are not limited to establishing rigid and stable rules, but also have a guiding and adaptive character, allowing for flexible decisions that can be adjusted to different contexts. The policies incorporate elements such as glossaries and explanations of open access, open science, and

research data sharing, as well as stakeholders responsibilities and institutional commitments.

4.1 Research data management in the Netherlands: progress and challenges

Although some normative convergence and guidance were observed in the policies, the analysis also revealed conceptual and terminological inconsistencies, divergent practices, and the omission of key elements for RDM outlined by the DCC (2017², p. 74 *apud* Costa; Cunha, 2019) in Section 2. Similar imprecisions in concepts and terminology were identified in both bibliographic and documentary sources, suggesting a lack of conceptual maturity in the field.

This scenario underscores the importance of further research in the field, given that RDM is a relatively recent practice which is still consolidating as an area of information management, and which is characterised by significant disciplinary variability. Table 1 presents the elements that enable the implementation of the FAIR principles, as well as findings extracted from the analysed documents regarding governance arrangements, institutional guidelines, and the administrative procedures adopted by universities in developing and operationalizing their policies. The ‘Incidences’ column shows how many policies include each element. This enables the extent to which these aspects have been standardised across institutions to be assessed.

Table 1 - Elements related to FAIR compliance

Elements	Incidences
Sharing data is mandatory	12
FAIR principles; Responsible for management; Local storage system; Minimum archiving period	11
Documentation; Rich descriptive metadata; Storage period after collection; Security system against intrusions/theft	9
Management of postgraduate research data; Mandatory DMP for all research	8
Responsible for data integrity	7
Updating the DMP throughout the research; Data steward; Open format files; Physical data management; Persistent identifiers; Collaborative research (ownership and management); Institutional model for DMP; Deadline for archiving data; Deadline for archiving the DMP	5
Archiving in external locations (not belonging to the institution); Graduate applicants must submit a DMP; classification of data in the DMP (impact and level of access); Data use license	4
Archiving in repositories (institutional and/or disciplinary); Indicates standard metadata; Maintains public metadata even for restricted access data; Enhanced security for personal, sensitive, and confidential data	3
The DMP archiving period is longer than that of the data	1

Source: Drawn up by the authors.

These findings contributed to understanding the scope of the RDM policies of the universities analysed and to deriving indicators that may inform potential applications within the Brazilian context.

4.2 FAIR-oriented management: preservation and operational limits

The Dutch universities that participated in the study have established that data sharing is an institutional requirement, not an option. However, the policies also reveal legal, ethical, or contractual limitations that could restrict access to the data.

Data system preservation is one of the most complex processes because it involves technical and administrative decisions requiring knowledge of data classification, risks, and impacts. In this sense, it is interesting to see if the policies provide information about local infrastructure for information security, backup, and technical support, as well as guidance on the necessary procedures and precautions during storage and archiving.

It was found that universities seek to ensure security and integrity. Regarding personal and sensitive data, the policies emphasise privacy safeguards and refer to documents such as university regulations on the use of local technologies, national legislation, EU law (particularly the General Data Protection Regulation), and national and international treaties on research ethics and integrity. Enhanced security protocols are also recommended, including access keys, encryption, and dedicated folders for storing high-risk data.

Dutch universities have a data management and sharing digital infrastructure supported by the national government and EU programmes. This infrastructure includes a national information centre and repository, Data Archiving and Networked Services (DANS); DataverseNL, adapted from Harvard Dataverse; 4TU.ResearchData; and the Collaborative University Computing Facilities (SURF)'s cloud storage services. For archiving in external repositories, certification is required through seals such as CoreTrustSeal, ISO 27001, or NEN 7510 to ensure data quality and security standards.

As far as preferences of participants of the institution are concerned, the University of Twente has determined that data originating from doctoral research must be archived exclusively within its own system. This requirement is also stipulated in the university's doctoral programme regulations. This directive demonstrates the ongoing consolidation of data governance, which is being integrated across different academic levels and institutional structures.

For security reasons, storing research data on personal devices, such as USB drives and laptops, or on commercial cloud services is discouraged. However, some universities tolerate this practice for temporary or backup copies. However, this practice is never acceptable for personal, sensitive, or confidential data.

The Dutch Code of Conduct for Research Integrity (2018, p. 20) states that raw and processed data should be “retained” according to the specifics of each discipline. However, the code does not specify whether this guideline refers to storage, archiving, or both. Nor does it provide specific recommendations for each area. University policies require archiving, sometimes referred to as “retention”, for at least ten years. The NWO funding agency “[...] expects data to be preserved

for at least ten years, unless legal provisions or disciplinary guidelines stipulate otherwise” (Cruz *et al.*, 2023, p. 6). However, some institutions have different requirements. For example, Utrecht University establishes a period of fifteen years or perpetual archiving for health data. Radboud University sets a period of seven years for postgraduate research data.

Regarding the timeframe for data archiving, different guidelines were identified, like: archiving should take place by the end of the research project, suggesting that archiving can occur during the project; data should be archived immediately after the research is completed, implying that archiving can occur before publication; and archiving should be performed after publication, either immediately or within a specific time limit. These variations reflect a concern for ensuring the timely availability of data and the need for greater alignment among institutional policies to prevent subjective interpretations and potential conflicts in collaborative research. The situation becomes more complex in cases where archiving is conditional upon publication, particularly because the publication process may take several months depending on the discipline or the editorial procedures of each journal.

Although management elements primarily apply to digital data, the policies also cover physical data. In such cases, storage and archiving should take place in secure, purpose-built environments. Where possible, these materials should be digitised and deposited in repositories. In any case, the repositories should include metadata and documentation of physical data, indicating the storage location and access modality.

The approach to metadata, which are essential for describing and making data findable, proved to be a critical point in the policies. Although the subject is widely mentioned, the approaches are fragile and limited to generic guidelines on how researchers should use “good metadata”, “sufficient metadata”, “as far as possible”, and “whenever possible”. The absence of reference to recognised schemes or standards emphasises gaps that can compromise interoperability, reuse and standardisation between institutions.

Documentation is an essential component of RDM and must be deposited alongside the relevant datasets. Some policies provide examples and guidelines

on what constitutes documentation, thereby contributing to a clearer understanding of its elements. The importance of descriptive metadata was also emphasised, as it is fundamental to contextualising and interpreting the data.

With regard to the assignment of identifiers and licenses for use, although the literature in this area highlights the strategic importance of these elements for the findability, accessibility and reuse of data, and provides guidance on permitted access and reuse, the analysed policies only superficially address these aspects, often merely recommending their adoption without mentioning tools, strategies or selection criteria. The University of Amsterdam is the only institution that explicitly states that researchers must assign a license to the dataset.

The choice of open file formats is important to ensure interoperability, preservation, and continuous access. The policies emphasise the importance of adopting open formats and present DANS guidelines for selecting sustainable and interoperable formats that consider technical, regulatory, and long-term preservation aspects. At least in this respect, it was possible to identify a source of information to provide standards and support to researchers.

Although institutional policies are usually normative, RDM policies also have an instructive and educational dimension. The texts include information on courses, workshops, and academic modules dedicated to RDM, which are offered by both data offices and university libraries. Dutch universities have invested in raising awareness and providing training within the academic community with the aim of developing specific data management competencies. In some postgraduate programmes, participation in such activities is compulsory, and some universities already require research proposals submitted by postgraduate students to be accompanied by a DMP. Regarding the distribution of responsibilities among stakeholders, supervisors are expected to guide students and share responsibility for data management, ensuring compliance with institutional standards.

4.3 Shared responsibilities: stakeholders and their roles

Identifying institutional stakeholders and their roles was a recurring theme in the policies. Although there is no standardised nomenclature for these actors, a hierarchical organisational structure encompassing various strategic units was

identified. This structure includes institutional leadership, such as presidents and chancellors, academic councils, and chairs of schools and departments; individual researchers; principal investigators; data stewards; university libraries; and information technology (IT) services units. Some institutions also include the Ethics and Compliance Office and University Counsel, which highlights the cross-cutting nature of research data governance.

Institutional roles and responsibilities are generally structured around five interdependent categories: governance; data management; infrastructure; monitoring and compliance; and operational support. This framework reflects an integrated management logic in which strategic, technical, and educational bodies operate in a coordinated and complementary manner.

The analysis reveals the central role of libraries and data stewards in providing technical support and capacity building to the academic community. This configuration reflects a mature institutional environment in which responsibilities are shared collaboratively and coherently. However, challenges remain regarding terminological standardisation and precisely delineating roles across different organisational units.

Within the RDM ecosystem, data stewards stand out due to the complexity and breadth of their duties. They provide guidance, supervision, and support to researchers throughout the data life cycle, from preparing and revising DMPs, to storing, archiving, and updating file formats and metadata. Furthermore, their responsibilities extend beyond direct interaction with researchers to include ongoing coordination with libraries, IT services, and academic leadership. This ensures the integration and coherence of management practices across the organisational framework.

As stakeholders, university libraries have also emerged as central hubs for information, guidance, training, and repository management. In certain contexts, there has been an overlap of functions observed between libraries and data stewards, particularly in activities related to data guidance and curation. However, an important characteristic of the European context is that education in library and information science is predominantly offered at the postgraduate level. This

influences the professional profile of these specialists and the institutional approach adopted by universities in RDM.

4.4 Documentary structure and governance

The Netherlands operates within a system that integrates national and transnational legislation. As an EU member, the country adopts the General Data Protection Regulation and the European Code of Conduct for Research Integrity, published by All European Academies (ALLEA, 2023), as key structural references.

Notable national frameworks include the Dutch Code of Conduct for Research Integrity, the Medical Research Involving Human Subjects Act, and the Animal Experiments Act. These documents are frequently cited in RDM policies and often include direct access links, reflecting a strong commitment to legal compliance and alignment with international standards. Table 2 summarises the structural elements that were repeatedly identified in the institutional RDM. The first column lists each element, and the second column shows how many policies explicitly mention it.

Table 2 - Documentary structure and institutional governance

Elements	Incidence
Introduction with background and context on open access, open science, and research data; Course and workshop offerings; Monitoring and evaluation mechanisms; Stakeholders with a description of their roles and responsibilities	10
Interdisciplinary committee (formulation, implementation, and updating of terms); Reference to legislation and governance documents; Data stewards; Domain Data Protocols (DDPs)	9
Loss of researcher's connection with the institution	6
Library services; policy review and update schedule; glossary of terms	5
Inclusion of a course on RDM in the curriculum; RDM Costs; Backup and recovery procedures	4
Intellectual property aspects; Use of external DMP models	3
Definition of data owner	2
Measures in cases of irregularities; Definition of periods and justifications for embargoes; Guidelines on data sharing prior to publication; Procedures for changes after publication of the research	1

Source: Drawn up by the authors.

One noteworthy aspect is the composition and role of the committees responsible for drafting the institutional guidelines. Documents listing their members revealed the participation of representatives from IT services, libraries, and faculty chairs and professors from different disciplines. The institution's highest authority appointing these committees reinforces the notion that RDM is a shared responsibility whose effectiveness depends on central administration's strategic engagement in leading cultural change, implementing new services, and integrating activities across different university sectors. This structure creates favorable conditions for adopting practices better aligned with each stakeholder's role, ensuring greater internal coherence.

In this context, the participation of library representatives in institutional committees confirms the leading role of these units in RDM, which is widely recognised in scholarly literature. Zeeland and Ringersma (2017, p. 154) emphasise that "[...] the role of libraries is not surprising, since they tend to provide services in data-related areas such as metadata and archiving", thus reinforcing their longstanding contribution to curating and preserving scientific information. Similarly, Tenopir *et al.* (2017) found that two-thirds of European libraries are involved in developing or planning data management policies, which confirms the strategic importance of these institutions to advancing open science.

Specific situations involving collaborative research were also considered, with an emphasis on data management and ownership. These cases include relationships with researchers from other institutions, funding agencies, and scientific publishers. The interests and requirements of these stakeholders must be explicitly stated in the DMP. This context tends to be more complex because it involves external stakeholders and different regulations, expectations, and legal obligations. While the need for clear, documented agreements is a common theme in the analysed texts, the policies do not detail the contractual terms of these arrangements. In these cases, DDPs are mentioned because the specifics may vary depending on the discipline or academic unit. Sometimes, the definition of agreements between the parties is left to the researchers themselves. This flexible approach is justifiable because it allows for adaptation to different collaborative

contexts while ensuring respect for the rights and responsibilities of those involved.

Although the policies address the stages of the data life cycle, they are imprecise regarding procedures for data disposal and destruction. They generally do not specify which data can or should be deleted or destroyed from institutional storage systems. This is a particularly relevant aspect given that a single research project can generate a large volume of raw and processed data, ranging from megabytes to terabytes. The policies also fail to establish minimum or maximum timeframes for such actions, as they typically do for archiving.

It is important to distinguish between the verbs “delete” and “destroy” conceptually. Although no bibliographic sources were found that define these terms in the context of RDM specifically, their meanings can be inferred based on etymology and technical usage. Deletion may refer to the removal of data from institutional systems while leaving copies on personal devices, laboratory computers, or cloud services. Destruction, on the other hand, implies the permanent and irreversible elimination of all copies, which is particularly recommended for personal, sensitive, or high-risk data. Given the critical nature of these procedures, institutional policies should address them with greater clarity.

Furthermore, no mechanisms were identified for reassessing the possibility of extending the retention period for datasets with high potential for reuse, citation, or scientific impact. The Erasmus University Rotterdam (2020) is notable in this regard because its policy stipulates that decisions regarding deletion or destruction due to the expiration of the retention period or for legal or ethical reasons must take into account legal, ethical, contractual, confidentiality, and security considerations. All actions must be documented for auditing purposes. When persistent identifiers have been assigned, the metadata should be preserved and updated with the deletion or destruction date and justification. However, the final destination of deleted files is not specified.

Regarding the monitoring and supervision of RDM, particular attention has been given to verifying the proper handling of personal and sensitive data, as well as ensuring compliance with the provisions established in DMPs. These DMPs must be updated throughout the course of research because they are not

static instruments. Strategies include random audits of projects and reports, for which faculty chairs and data stewards are responsible. In cases of irregularities, institutions refer to the Dutch and European Codes of Conduct for Research Integrity to guide the application of sanctions.

4.5 Operational and terminological gaps

Although these policies are not intended as instruction manuals, their recent and experimental nature can lead to ambiguities and misinterpretations. Key management aspects remain insufficiently addressed. Among the superficially addressed aspects, the following stand out.

4.5.1 Costs associated

The treatment was generally superficial, limited to recommending that expenses be included in the DMP without specifying the elements that may generate costs. According to Elixir Europe ([2021?]), budgeting and cost estimation “[...] depend on local and temporal circumstances, institutional resources, services, and policies”, and expenses may arise “even after the project has ended”. The main cost factors identified include: (a) anonymisation and pseudonymisation, which require specialised professionals and proprietary software; (b) storage and preservation, particularly when data volume exceeds institutional infrastructure capacity, necessitating the use of external repositories or cloud services; (c) assignment of persistent identifiers to datasets; (d) digitisation of physical data and associated documentation; and (e) acquisition or subscription to software and tools for data collection, processing, and management.

4.5.2 Embargoes and access restrictions

Restrictions of access are common and necessary practices, particularly in cases involving patents, commercialisation, or ethical and legal risks. However, this aspect was addressed superficially, explicit in the policies of Delft and Twente universities, without presenting objective criteria or clear justifications for its application. Such normative fragility may allow indiscriminate restrictions, as the

literature indicates that barriers to data sharing often stem from distrust, fear of plagiarism, loss of publication opportunities, and academic competitiveness (Veiga, 2017). Although data sharing is mandatory in all the policies analysed, these factors underscore the need to reconcile legitimate protection with the institutional commitment to open science.

4.5.3 Data exchange prior to publication of the research

This element was addressed only by Utrecht University (2019), which requires the formalisation of a Data Transfer Agreement with both internal colleagues and external partners. The absence of such guidance in the other policies represents a gap, particularly in contexts where early data sharing is essential to accelerate new discoveries. The covid-19 pandemic exemplified the critical importance of data exchange during the research process to support the global response to the disease. The establishment of clear regulations and formal procedures for this type of data sharing contributes to ensuring transparency, accountability, and reciprocity.

4.5.4 Data modification after research

This is a sensitive issue, but it only applies to processed data for health data. In this case, it is established that any corrections must follow careful procedures and be authorised only by a responsible professional, not by researchers. All changes must be documented and recorded in audit trails (Utrecht University, 2019).

4.5.5 Conceptual and terminological inaccuracy

Conceptual inaccuracies were identified, the misunderstanding of which could lead to operational errors, notably: (a) *Storage and archiving*: these procedures were often treated as synonyms or used interchangeably, both in the policies reviewed and in documents from other institutions, as well as in part of the literature. *Storage* refers to the temporary retention of data during the course of research, usually with restricted access and a focus on security, integrity, and active use. *Archiving*, in turn, takes place after the completion or publication of the research, involving the deposit of data in public repositories for long-term

preservation, reproducibility, and sharing. This misconception is so frequent that it is explicitly addressed in the policies of Utrecht University and Radboud University, which present the terms correctly; (b) *Data deletion and destruction*: previously discussed in this study, these terms refer to distinct actions that are often misunderstood. *Deletion* refers to the removal of data from institutional systems, while copies may still remain on external devices; *destruction* entails the definitive and irreversible elimination of all copies. The lack of distinction between the two may lead to misinterpretation and inconsistencies in implementation; (c) *Stakeholders*: ambiguity was observed in the designation of roles such as data steward, data manager, and data administrator. In Portuguese, these expressions may suggest equivalent functions, although they involve distinct scopes. The data manager generally provides technical and operational support for RDM, whereas the data steward is responsible for curation, preservation, and strategic alignment with institutional policies and best practices. The data administrator, on the other hand, is typically associated with the administration of information systems, not necessarily limited to the research context. In some documents, however, these roles appear without a clear distinction between technical, operational, and strategic responsibilities. Additionally, some universities have structured support networks, comprising data administrators, privacy and security officers, and information managers, with overlapping and poorly defined roles, making the separation between data manager and data steward particularly problematic.

5 Final considerations

Despite notable progress in the scientific field, research data sharing continues to pose significant challenges for management, particularly regarding the standardisation and interoperability of regulatory frameworks.

Analysis of the RDM policies of Dutch universities revealed a reference model based on balancing openness with data protection, encapsulated by the following principle: “as open as possible, as closed as necessary”, and in the adoption of the FAIR principles as an institutional goal. A systematic effort toward alignment among transnational (European Union), national (Dutch), and

institutional (university-level) regulations was observed, reflecting a coherent and consolidated governance ecosystem within the Dutch context.

The findings revealed a set of shared principles covering the allocation of roles and responsibilities, participatory management structures, specialised technical support, and the integration of local and national digital infrastructures. This promotes interoperability and enables unified data discovery.

Identifying conceptual, terminological, and operational gaps in analysed policies provides Brazilian universities with strategic insights to recognise aspects requiring improvement in light of international experiences. This understanding can support the development of more comprehensive, coherent, and consistent frameworks that align with best practices on a global scale. At the same time, positive elements can be incorporated critically and adaptively, taking into account the legal, ethical, institutional, disciplinary, and sociocultural specificities of the national scientific ecosystem.

This research makes a contribution to the field of information science by deepening the analysis of the normative frameworks that underpin RDM and curation. It underscores the strategic role of the discipline in mediating the relationship between scientific production, institutional policy development, and equitable access to information. By linking data governance practices with the principles of information organisation, preservation, ethics, and dissemination, the study reaffirms the centrality of information science as an interdisciplinary field that is essential for addressing informational challenges within the open science paradigm. Consequently, this research advances both the theoretical and practical dimensions of the institutionalisation of RDM by providing a foundation for the development of policies aligned with the principles of open science, research transparency, and citizen science.

Nevertheless, the study acknowledges its limitation in focusing primarily on general institutional policies, without delving into disciplinary specificities. Future research is therefore encouraged to explore DDPs in order to address the particular requirements of each field of knowledge and enhance domain-specific data management practices.

Finally, it is essential to broaden the analytical scope through comparative studies in countries beyond the European context. For Brazil, participation in multilateral networks such as BRICS represents a strategic opportunity to strengthen international scientific and technological cooperation, harmonise its research data policies with those of partner nations, and simultaneously respect the regulatory, cultural, and institutional particularities of each collaborating country.

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Políticas institucionais para gestão de dados de pesquisa: uma análise das estruturas universitárias holandesas

Resumo: O estudo analisa o conteúdo normativo das políticas institucionais para gestão de dados de pesquisa adotadas por universidades holandesas, com o objetivo de identificar seus elementos estruturais, estratégias de gestão e grau de alinhamento com princípios que asseguram a encontrabilidade, acessibilidade, interoperabilidade e reutilização dos dados. A pesquisa tem caráter qualitativo, de natureza exploratória e baseia-se na análise documental sistemática de fontes formais e oficiais das universidades. Os achados permitiram mapear a frequência e a distribuição de elementos comuns, bem como identificar lacunas conceituais e operacionais. Os resultados evidenciaram a consolidação de um modelo de governança articulado entre instâncias nacionais, europeias e institucionais, sustentado pela integração de infraestruturas digitais, apoio técnico especializado e definição de responsabilidades. As políticas analisadas demonstram forte aderência aos princípios FAIR, reforçando a obrigatoriedade do compartilhamento de dados e a responsabilidade ética e legal das instituições. Contudo, persistem fragilidades em aspectos como metadados, descarte, gestão de custos e clareza terminológica. Conclui-se que o modelo holandês constitui uma referência pela maturidade de suas práticas e pela integração entre abertura e proteção dos dados. Os resultados oferecem subsídios teóricos e práticos para universidades brasileiras desenvolverem políticas abrangentes, alinhadas a padrões internacionais e sensíveis às especificidades locais, contribuindo para a institucionalização da gestão de dados de pesquisa e para o fortalecimento da ciência aberta no Brasil.

Palavras-chave: gestão de dados de pesquisa; universidades brasileiras; governança de dados científicos

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Data availability statement

The entire dataset supporting the results of this study has been published within the article itself.

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