# A Survey of Research Data Management Practices in Finnish Universities*

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2026-07-24

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## Abstract

Exploring the practical experience of research data management services in Finnish universities provides an important reference for advancing the high-quality development of research data management services in Chinese universities. Taking 13 public universities in Finland as the research subjects, this study uses online research and content analysis to examine the current state of research data management services in these universities. Finnish universities demonstrate distinctive characteristics in infrastructure operation, service team formation, and data protection measures. Recommendations are proposed, including accelerating the construction of national research data infrastructure, forming flexible professional service teams, and emphasizing the governance of privacy risks in research data.

## Full Text

【User ·Service】

# A Survey of Research Data Management Practices in Finnish Universities*

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**Abstract** Exploring the practical experience of research data management services in Finnish universities has important reference value for promoting the high-quality development of research data management services in Chinese universities. Taking 13 public universities in Finland as the survey objects, this study uses online investigation and content analysis to examine the current status of research data management services in these universities. Finnish universities show distinctive characteristics in infrastructure operation, service-team building, and data-protection measures. The paper proposes recommendations such as accelerating the construction of national-level research data infrastructure, forming flexible professional service teams, and attaching importance to the governance of privacy risks in research data.

[**Keywords**] research data management; service system; data protection; university library; Finland

[**Chinese Library Classification No.**] G258.6; G250.7 [**Document Code**] A [**Article ID**] 1003-7845(2026)02-0082-06

[**Citation Format**] Cui Tao. A Survey of Research Data Management Practices in Finnish Universities[J]. *Library Work in Colleges and Universities*, 2026(2):82–87.

## Introduction

As an advanced innovation-oriented country in the world, Finland has long ranked among the global leaders in science, technology, and education. In the course of the new round of scientific and technological revolution, the idea of moving toward open science has become a path of transformation for the Finnish government. As early as 2014, Finland' s Ministry of Education and Culture launched an open science research project, setting the overall goal of becoming a global leader in open research by 2017. In 2019, the *Declaration for Open Science and Research (2020-2025)* issued by Finland' s National Open Science and Research Steering Group identified four key areas of focus for open science —open scholarly culture, open research data, open access publications, and open educational resources—and outlined a vision for the future development of open science in Finland: open science will be fully integrated into researchers'everyday work, and the Finnish research community will become an international pioneer in open science[2]. In 2020, the National Library of Finland launched the "Digital Open Memory" project, aimed at providing data-driven services for researchers, especially those in the field of digital humanities. In 2022, monitoring results concerning the practices and current state of open science in Finnish higher education institutions showed substantial differences among institutions in the development of the four areas. Among them, the area of open research data was the most mature: about 57% of Finnish research universities (14 institutions) and about 35% of universities of applied sciences (23 institutions) had reached an advanced level in open research data[3]. It can thus be seen that Finnish universities have devoted considerable effort to the practice of open research data and achieved fruitful results. As a key pathway for advancing open data, Finnish universities provide researchers with services such as research data collection, recording, organization, and storage, and have built a relatively complete value chain for the production and dissemination of open research data.

At present, Finland' s higher education system is mainly composed of 13 comprehensive academic universities and 23 universities of applied sciences. The 13 comprehensive academic universities are the University of Helsinki, Aalto University, the University of Oulu, the University of Turku, Lappeenranta University of Technology, Tampere University, the University of Jyväskylä, the University of Eastern Finland, Åbo Akademi University, the University of Vaasa, the University of Lapland, Hanken School of Economics, and the University of the Arts Helsinki. These institutions enjoy a global reputation in education for their outstanding educational and research achievements. Taking the above 13 universities as the survey objects, this study reviews the current practice of their research data management services and summarizes their development experience, with the aim of providing reference for promoting the development of research data management services in Chinese universities.

# 1 Current Status of Research Data Management Services in Finnish Universities

Research data management is a systematic task; a single department alone cannot provide the required support and training services. By establishing data-support teams in a "first-line/second-line" format, Finnish universities have been able to better meet researchers' needs for research data management. The first-line support team consists of data management specialists embedded in secondary colleges and departments, providing support for specific operational work; the second-line support team is a professional network composed of the library, information technology center, central archives, research services office, human resources and legal services departments, and others, providing service planning and guidance. The survey found that the service content of data-support teams in Finnish universities mainly involves data management plans, ethical and legal support, data organization and documentation, data stor-

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* This article is one of the research outcomes of the Shandong University of Political Science and Law research project "Research on the Construction of a Research Data Management Service System for University Libraries in the Context of Data Elements" (Project No.: 2023Q01B) and the Shandong Provincial Social Science Planning Research Project "Research on the Evolution Path, Early-Warning Mechanism, and Governance Countermeasures of Online Public Opinion in Universities from the Perspective of Generative AI" (Project No.: 24CSZJ24).

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Date received: 2025-10-22 Responsible editor: Xie Weizhen

storage and sharing, data publication, long-term data preservation, and personal data protection throughout the entire service process.

## 1.1 Data Management Plans

A data management plan (Data Management Plan, DMP) is a management plan that describes the entire life cycle of a research dataset. Preparing a DMP can help researchers identify in advance privacy risks and legal requirements in the management process, thereby ensuring data quality and integrity. The Research Council of Finland stipulates that data management plans are submitted in two stages: at the project application stage, applicants submit a plan that briefly describes data management; researchers who receive funding then submit a complete data management plan within the following eight weeks[4].

To support researchers in preparing high-quality data management plans, Finnish universities provide substantial support in DMP tools, DMP review, and advice. In terms of DMP tools, Finnish universities strongly recommend

the online tool DMPTuuli, which is based on the DMPonline code and developed by Finland' s Tuuli project. This tool integrates DMP templates provided by the Academy of Finland, the Finnish Cultural Foundation, the "Horizon Europe" programme, the Finnish Business Association, and others, and researchers may use it free of charge[5]. Some universities provide DMP review services for their own researchers. Researchers at the University of Helsinki may send their DMPs by email to the library' s data support team, whose experts review the DMPs according to requirements and provide timely feedback[6]. The research data policies of the University of Oulu and Tampere University clearly require that DMPs be approved by departmental or faculty administrators before they can be sent to research funders[7]. Taking Tampere University' s data management plan workflow as an example, the faculty encourages funded researchers to seek help from the library' s data specialists in preparing DMPs[8]. Researchers send their DMPs to the Research Data Services unit for comments; after receiving feedback within one week, they resubmit the revised DMPs to Research Data Services. Research Data Services then sends approved DMPs to the heads of the faculties, and after approval, the DMPs are added to the Academy of Finland' s SARA online service system[9].

### 1.2 Ethical and Legal Support

Legal and ethical issues affect the ways in which researchers collect, store, and process data. Legal and ethical issues related to data management involve data protection laws, data-sharing agreements, data ownership, open-data licences, copyright licences for secondary data use, and other intellectual property rights. Before a research project begins, Finnish universities require researchers to sign agreements concerning data ownership and other intellectual property rights. For example, the University of Lapland's research data policy requires that agreement be reached as early as possible on the ownership of research datasets, user rights, terms of use, and authorship[10]; the University of Jyväskylä provides researchers with ready-made contract agreement templates and offers guidance and advice on the design and implementation of data protection measures[11].

Finnish universities stipulate that researchers should be responsible for the ethical issues involved in their research, and that research should comply with the guidelines of the Finnish National Board on Research Integrity (TENK), namely the *Finnish Code of Conduct for Research Integrity and Procedures for Handling Alleged Violations of Research Integrity in Finland*[12]. In response, universities have established specialized research integrity adviser teams and research ethics review committees to help researchers address ethical and moral issues in data management. For example, the University of Helsinki has established four committees responsible for ethical review: the Research Ethics Committee in the Humanities and Social and Behavioural Sciences, the Research Ethics Committee of the Faculty of Medicine, the Research Ethics Committee for Animal Research, and the Research Ethics Committee for Natural, Biological, Environmental, and Engineering Sciences[13].

### 1.3 Data Organization and Documentation

Data organization and documentation are important tasks in research data management. As projects continue to advance and the volume of research data increases, data will become difficult to manage and maintain if there is no clear organizational strategy. For this reason, Finnish universities mainly provide concrete service support in terms of data documentation and metadata. The University of Helsinki' s research data policy states that documentation and metadata related to research data should follow discipline-specific standards so that datasets can be reused in future research projects and further enriched[14]. Data documentation refers to descriptive files for research data; that is, it provides detailed explanations of the composition, creation methods, and usage methods of datasets. High-quality documentation is an important component of responsible research conduct and can ensure that research data are findable, interpretable, and reusable. The University of Lapland disseminates best practices for preparing data documentation to researchers, such as naming rules for data documents and folders, folder structures, version control, and specifications for writing dataset README files[15]. High-quality metadata can greatly improve the discoverability of research data. The University of Eastern Finland provides researchers with services in areas such as selecting metadata standards, metadata creation tools, and metadata publication[16].

### 1.4 Data Storage and Sharing

The storage method for research data is affected by factors such as data type, dataset size, and the sensitivity of the data. Lappeenranta–Lahti University of Technology provides different storage solutions according to data type. For example, for quantitative datasets, it recommends using the IDA research data storage service, Zenodo, or the EUDAT B2DROP and B2SHARE services; for qualitative datasets that require anonymization, it recommends using services provided by the Finnish Social Science Data Archive (FSD); and for small and open datasets, it recommends storing them in LUTPub' s research datasets[17]. The University of Jyväskylä provides various storage solutions according to data type and data sensitivity. For example, the Nextcloud platform is used for cloud storage of non-sensitive data, and the Research-video.jyu.fi management system is used for the storage and sharing of non-sensitive audiovisual data. In addition, for large sensitive datasets, it recommends using the CollabRoom cloud service or the Cryptomator encryption program to store them in Nextcloud[18]. Cryptomator creates virtual drives···

···tool, which can display, edit, and expand encrypted content. Some universities have purchased off-campus third-party services, such as OneDrive for Business, for cloud storage and file sharing. In addition, Finnish universities require researchers to back up and manage datasets during data storage. For example, Tampere University requires at least three copies of research datasets to be backed up and stored in different locations in the form of "original–local copy–remote copy" [19]. In terms of data sharing, Finnish universities mostly use the

Funet file transfer network provided by the Finnish IT Center for Science Ltd (CSC-IT Center for Science Ltd, CSC). This service runs on a web browser and can send files larger than 100 GB.

### 1.5 Data Publication

In the process of opening research data, selecting the best data publication channel is an important challenge. The data publication channels recommended by Finnish universities mainly include three categories: data repositories, data journals, and peer-reviewed scientific publications. Among them, data repositories can create persistent identifiers for data, helping researchers identify, access, and cite datasets, and are therefore widely recommended by universities. For the publication of metadata, Finnish universities recommend using the Qvain metadata tool on the Fairdata platform to describe and publish metadata that conform to the FAIR principles. Data described and published through Qvain are automatically transmitted to the Etsin research dataset finder and Finland' s national research information platform (research.fi)[20]. For publication of the datasets themselves, Finnish universities recommend that researchers first search for discipline-specific data repositories through the re3data.org platform. As a registry of research data repositories, re3data.org currently covers more than 2,000 repositories. If no discipline-specific repository is found, national-level data storage services may be selected, such as the Aila data service provided by FSD[21], the IDA research data storage service, and the Language Bank of Finland service[22]. If neither of the above two types of repositories can be found, then an international general-purpose repository suitable for all disciplines and data types, such as Zenodo or Figshare, should be selected.

### 1.6 Long-Term Data Preservation

Finland stipulates that the retention period for research data is generally five years after the end of the research; the retention period for medical and health data is usually 15 years; and some data on ethnic cultural heritage with irreplaceable value must be preserved permanently. Generally speaking, long-term preservation is intended for datasets that have a retention period of more than 25 years and are of particular value. Long-term preservation means that digital information remains understandable and usable over decades or even centuries, even if equipment, software, and file formats change or become obsolete during this period. For such data, Finnish universities have generally adopted the Fairdata-PAS long-term digital preservation service provided by CSC for processing[23]. Before using this service, universities need to assess whether a dataset is suitable for long-term preservation. If necessary, the university will sign a service contract with CSC before storing the data. Throughout the entire storage period, data ownership still belongs to each university, while the service is provided by CSC and is open free of charge to personnel affiliated with Finnish research organizations.

### 1.7 Personal Data Protection

Personal data protection runs through the entire practice of research data management services in Finnish universities. Finnish universities have adopted a series of measures to address complex data protection issues. First, they formulate data protection policies. Five universities—University of Helsinki, Aalto University, University of Turku, Åbo Akademi University, and Hanken School of Economics—have formulated dedicated data protection policies. Taking Aalto University as an example, the university' s data protection policy clarifies the principles that relevant entities within the university should follow when processing personal data[24]. Second, they clarify data protection pathways. Aalto University, University of Turku, and Tampere University have formulated data-protection roadmaps based on the data life cycle, in order to guide data controllers in adopting detailed measures at different stages of research to cope with complex data protection issues. Taking Tampere University as an example, the university' s data-protection roadmap contains 10 key processes, each of which specifies the content elements of data protection and provides concrete guidance for researchers to handle data protection issues efficiently and correctly[25]. Third, they appoint data protection officers. Aalto University, University of Oulu, Åbo Akademi University, Hanken School of Economics, and other universities have data protection officers, and researchers may seek service support at any time on personal data protection issues. Taking the University of Oulu as an example, each faculty of the university is equipped with at least two data protection officers. The requirements for the position are a higher-education degree in law, professional knowledge of personal data protection, and a certain level of practical data management capability[26].

## 2 Characteristic Analysis of Research Data Management Services in Finnish Universities

### 2.1 Comprehensive Service Content, with Sound Infrastructure as Support

The research data management services carried out by Finnish universities involve many aspects, including data management plans, data organization and storage, and data sharing and publication. The service forms are diverse and the service content is comprehensive. The smooth development of these services benefits from sound infrastructure with a high degree of sharing. In the service process, in addition to building local data repositories and platform tools, Finnish universities also make use of third-party infrastructure, such as national open data infrastructure and paid services from vendors. Among these, the Fairdata platform has the highest utilization rate. Since 2019, the Finnish Ministry of Education and Culture has commissioned CSC to provide Fairdata services to Finnish universities and research institutions in order to meet the research data management needs of higher education institutions[27]. The Fairdata platform provides the IDA research data storage service, the Etsin research dataset

finder, the Qvain metadata tool, as well as auxiliary services such as Metax identity management and digital preservation services for research data[28]. It can be seen that the smooth advancement of research data management services in Finnish universities is inseparable from the support of multilevel and diversified data infrastructure.

### 2.2 Diverse Service Topics, with Stable and Efficient Service Teams as the Guarantee

Researchers' data management needs are dynamic and diverse, involving the writing of data management plans, the use of data platforms and tools, data anonymization processing, data licensing and sharing, and other aspects. To meet researchers'

diverse data-management needs. In their service practice, Finnish universities have established data-service support teams in a "first-line/second-line" format. First-line support teams usually have extensive practical experience in data management. Through direct contact with researchers, they rapidly identify and respond to researchers' data-management needs, providing support in data collection, organization, storage, and archiving to ensure the smooth implementation of data-management activities. Second-line support teams assume important responsibilities for coordination and planning in data-management work. On the one hand, through collaboration among personnel across departments, second-line support teams are responsible for overall planning and strategic guidance for university-wide data-management work, ensuring consistency in data management. On the other hand, by recruiting and training data-management specialists, second-line support teams provide a reserve of personnel for the expansion and development of first-line support teams, thereby meeting the growing demand for data management.

### 2.3 Sustainable Service Development: Diversified Data-Protection Measures Are Key

The secure protection of research data is an important and highly challenging task in university research data management services. Finnish universities extend the protection of personal data throughout the entire life cycle of research data, ensuring that privacy-protection requirements are met in every stage, including collection, storage, use, sharing, and destruction. On the basis of data-protection policies, they clarify the basic principles for research-data collection, organization, storage, transmission, archiving, deletion, and destruction, while also defining the roles and responsibilities of all stakeholders. Data-protection roadmaps provide strategic planning, guiding researchers to adopt appropriate and effective data-protection measures so as to achieve data-protection goals in stages. In addition, data-protection officers are appointed to supervise and guide researchers in resolving specific data-protection issues. Overall, data-protection policies provide the legal basis and normative principles for the secure protection of research data; data-protection roadmaps translate these bases and principles

into concrete phased objectives; and data-protection officers are responsible for supervision and implementation, ensuring that policies and roadmaps are carried out in day-to-day data-management activities. The three complement one another, creating a systematic and compliant environment for the protection of researchers' personal data.

## 3 Implications of Finnish University Research Data Management Practices for China

### 3.1 Accelerating the Construction of National-Level Research Data Infrastructure and Improving Mechanisms for Open Sharing and Integrated Use

From the perspective of data management, data infrastructure refers to integrated facilities for data processing, storage, sharing, publication, and security protection for researchers, supported by networks, computing power, and related resources. It is an organic whole encompassing hardware, software, sharing protocols, standards and specifications, and mechanism design. The smooth development of research data management services in Finnish universities benefits from well-developed infrastructure. In addition to building their own institutional data repositories, universities have also purchased third-party shared infrastructure for support; for example, DMPTuuli has become the preferred tool for data-management work in most universities. In addition, Finnish universities have introduced data infrastructure from CSC, FSD, and others, which not only reduces the difficulty of developing local data facilities but also ensures the aggregation of research data and the unification of standards.

In China, the overall planning and layout of national-level research data infrastructure remain relatively lagging; facilities are comparatively dispersed, and the degree of sharing is relatively low, making it difficult to promote the development of university research data management services. At the same time, when universities independently develop infrastructure, they face multiple difficulties in terms of manpower, financial resources, and technology; only a small number of "Double First-Class" universities possess such capacity. It is therefore evident that the absence of data infrastructure has seriously impeded the development of university research data management services. The *Decision of the Central Committee of the Communist Party of China on Further Comprehensively Deepening Reform and Advancing Chinese-Style Modernization* put forward the overall requirement to "build and operate national data infrastructure and promote data sharing"

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. Therefore, China should accelerate the layout of research data infrastructure, with comprehensive consideration given to two aspects: top-level design and development/application. On the one hand, benchmark facilities should be launched to play a demonstrative role. Under the guidance of the Ministry of Education, the National Data Administration, and other bodies, cooperation

among universities, research institutions, and enterprises should be promoted in a crowdsourcing manner, facilitating the intensive joint construction of research data infrastructure projects in different fields, ensuring unified technical standards, and promptly launching benchmark infrastructure and promoting its application, so as to realize "hard connectivity" in research data infrastructure. On the other hand, open mechanisms should be explored and sharing effects strengthened. From the perspective of improving facility utilization rates, reasonable open-sharing mechanisms should be designed for universities, research institutions, enterprises, and other entities, with lower application thresholds and expanded openness, so as to give full play to the overall supporting role of national-level research data infrastructure and promote the realization of "soft connectivity" in research data infrastructure



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### 3.2 Establishing Professional Research Data Management Service Teams and Promoting Flexible Organizational Development

A service team that combines flexibility and stability is a key condition for the sustainable operation of university research data management services. At the present stage, research data management services in Chinese universities still exhibit a library-led pattern of "single-line advancement and departmental circulation." On the one hand, cross-departmental cooperation mechanisms have not yet been established; libraries have not been able to build stable collaborative mechanisms with university research management departments, information technology departments, and others, making it difficult to connect the service chain. On the other hand, constrained by staffing quotas and capability structures, libraries have relatively few dedicated data librarians, making it difficult for them to penetrate the front line of research; services often remain at the level of consultation and advice, and it is difficult to form sustained embedded support.

Drawing on the experience of Finnish universities in building research data management service teams, Chinese universities need to take the library as the hub and join with relevant internal departments to establish professional service teams, enhance first-line support capacity, and realize embedded services throughout the entire process. First, teams should be established using a flattened structure. A flattened structure is an organizational structure with few management levels and a broad span of management. Research data management is a collaborative task, and stakeholders such as university libraries, information technology departments, and research management departments need to participate jointly in the data-management process. A flattened organizational structure can make collaboration among university departments more compact and efficient, weaken management hierarchies, reduce passive participation, grant greater autonomy to multiple actors, and thereby improve service

efficiency



. Second, team levels and divisions of responsibility should be clearly defined. Drawing on the practical experience of Finnish universities, Chinese universities may refer

consider forming its own service team in a "front-line/second-line" format. The second-line service team may be composed of persons in charge or key staff from the library, departments and schools, the legal affairs office, and other units; it is responsible for the overall planning of research data management and plays a guiding and coordinating role. The front-line service team consists of data management specialists, is under the direct management of the second-line service team, and is embedded in departments, schools, and research teams to carry out specific data management work. Data management specialists may include both full-time and part-time personnel. For example, Aalto University's Data Agents project recruits multidisciplinary volunteers to serve as data agents and participate in management[32], thereby easing the shortage of human resources in universities and stimulating researchers' enthusiasm for engaging in research data management practice. Third, promote the flexible development of teams. A flexible team is a temporary organization established across units, departments, and specialties to complete a specific project or task; it has advantages such as rapid response, strong resource-integration capability, and flexible working methods[33]. Researchers' data management needs are highly diverse, and universities should build flexible service teams so as to respond rapidly to data needs through organizational agility[34]. At the same time, flexible data management teams conduct "people-centered" and "humanized management" and adopt non-compulsory methods, which can, to a certain extent, sustain the long-term operation of the team.

### 3.3 Emphasizing the governance of privacy risks in research data and adopting multiple measures to achieve secure data management

Privacy protection is an extremely challenging aspect of research data management services. Finnish universities have adopted multiple measures to address various risks in the data management process and ensure that research data are managed safely and effectively. In China, the prevention and governance of privacy risks in research data have not yet received sufficient attention; it is necessary to further strengthen the protection of research data and ensure standardized management, effective preservation, and secure sharing. Drawing on the experience of Finnish universities, Chinese universities may explore this issue from three dimensions: policies and regulations, technological application, and literacy education. At the policy level, under the guidance of legal frameworks such as the *Data Security Law of the People' s Republic of China* and the *Personal Information Protection Law of the People' s Republic of China*, universities should formulate policies for the protection of research data. Data policies should cover data encryption technologies, data privacy risk assessment,

accountability mechanisms, access control, and other matters; at the same time, they should clearly define the scope of application and management objects of the policies, and clarify the responsibilities of all stakeholders in the data-protection process. At the application level, means of protecting data privacy and security should be strengthened. Research data privacy protection involves multiple technical methods, including data de-identification and anonymization, data encryption, and predictive modeling for data privacy protection[35]. Chinese universities should actively explore new technologies for data protection and integrate them into the development and use of data platforms, thereby realizing secure protection of research data. At the education level, efforts should be made to improve researchers' data literacy. Research data literacy affects researchers' data skills and ethical standards; a high level of data literacy, especially privacy literacy, helps researchers clearly identify and proactively avoid data privacy risks[36]. Therefore, universities should organize relevant experts to develop training courses on research data literacy, covering topics such as the identification of data privacy risks, knowledge of data laws and regulations, and methods for assessing data privacy, while also comprehensively improving researchers' data literacy through lectures, training, and other means.

## 4 Conclusion

As a pioneer and leader of the open science movement, Finland, through years of policy promotion and accumulated practice, has developed a model for university research data management services that integrates comprehensive service content, stable operating mechanisms, data security protection, and supporting national policies. The development of research data management services in Chinese universities is timely. Drawing on the practical experience of Finnish universities, China should ensure that top-level design is "coordinated," infrastructure is "built up," and talent teams are "strengthened," so as to advance the high-quality development of research data management services in Chinese universities in a coordinated manner.

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# Research on Research Data Management Practices in Finnish Universities

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**Abstract** Exploring the practical experience of research data management services in Finnish universities holds significant reference value for promoting the high-quality development of such services in domestic universities. This study analyzes the current state of research data management services across thirteen Finnish public universities using online investigation and content analysis. Finnish universities exhibit distinct characteristics in infrastructure operation, service team building, and data protection measures. Suggestions are proposed to accelerate the construction of national-level research data infrastructure, establish flexible professional service teams, and enhance the governance of research data privacy risks.

**Keywords** Research data management; Service system; Data protection; University library; Finland

*Note: Figure translations are in progress. See original paper for figures.*