RDM in a Decentralised University Ecosystem—A Case Study of the University of Cologne

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ABSTRACT

The University of Cologne (UoC) has historically grown in highly decentralised structures. This is reflected by a two-layered library structure as well as by a number of decentralised research data management (RDM) activities established on the faculty and research consortium level. With the aim to foster networking, cooperation, and synergies between existing activities, a university-wide RDM will be established. A one-year feasibility study was commissioned by the Rectorate in 2016 and carried out by the department research management, library and computing centre. One study outcome was the adoption of a university-wide research data guideline. Based on a comprehensive RDM service portfolio, measures were developed to put a central RDM into practice. The challenges have been to find the right level of integration and adaptation of existing and established decentralised structures and to develop additional new structures and services.

We will report on first steps to map out central RDM practices at the UoC and to develop a structure of cooperation between loosely coupled information infrastructure actors. Central elements of this structure are a competence center, an RDM expert network, a forum for exchange about RDM and associated topics as well as the faculties with their decentralized, domain-specific RDM services. The Cologne Competence Center for Research Data Management (C³RDM) was founded at the end of 2018 and is still in its development phase. It provides a one-stop entry point for all questions regarding RDM. The center itself provides basic and generic RDM services, such as training, consulting, and data publication support, and acts as a hub to the decentral experts, information infrastructure actors, and resources.

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INTRODUCTION

Research data (analogue but in particular digital) are increasingly becoming an important asset of many scientific arguments and scholarly communication. This is especially the case in data-driven research. They are key elements when it comes to reproducibility of scientific results and reuse of data. Therefore, research data management is becoming an integral part of the research life cycle. Some disciplines have long traditions in caring for data, and in those cases, the disciplinary communities have established protocols, measures, and infrastructures to handle research data that are underlying the scientific results. On the other hand, research and in particular education are to a large extent carried out at universities. Although German universities have formally very similar organisational structures, each of them exhibits its own particularities in terms of organisational structures, strategies, traditions, and information infrastructures (Symanski 2012).

Universities have recognised the strategic importance of institutional support for RDM (HRK 2014; HRK 2015). However, the challenge of RDM has been described as a wicked problem (Cox, Pinfield & Smith 2016). There are complex stakeholder networks at play, and it is key to identify the relevant stakeholders and to initiate a sense-making dialogue to tackle the RDM problem and explore solutions suitable for the particular stakeholder configuration (Calton & Payne 2003; Childs & McLeod 2013). However, there might not be *one* solution, as in a highly dynamic complex system, the conditions are changing constantly (Adler 2015).

As a consequence, there are different approaches to institutional support of handling and managing research data. Cox et al. (2017) present an international survey on RDM practices in which the central information infrastructure institutions take the initiative to provide RDM support. These initiatives are often led by the university libraries (Cox et al. 2017). As opposed to many other countries, such as the United Kingdom, United States, or Australia, in Germany, there is currently no nationwide strategy to initialise top-down RDM activities for universities on the political level. Thus, each German state can individually coordinate its RDM processes. Additionally, on the state level of North Rhine-Westphalia (NRW) the Higher Education Autonomy Act (Hochschulfreiheitsgesetz) also advocates self-government of the universities. Thus, each university can decide on its own about setting up and establishing infrastructures, such as central or decentralised RDM services. From the funders perspective, there are often only guidelines and recommendations available, such as the guidelines of research data handling of the German Research Foundation.[1] Currently, it is the responsibility of each researcher and research institution to take care of their data. That is why a quite heterogeneous RDM landscape has developed in Germany that is a mixture of project-driven infrastructure development (e.g., information management and infrastructure subprojects in Collaborative Research Centers),[2] initiatives of central university facilities or university-wide initiatives (e.g., Göttingen eResearch Alliance),[3] state-wide initiatives (e.g., Baden-Wuerttemberg,[4] Hesse,[5] North Rhine-Westphalia).[6] All these initiatives present varying engagement of individual stakeholders (in particular libraries, computing centers, research offices, university leadership, and researchers) and different levels of maturity (also in terms of scope of services). This means that a large number of experiments of implementing RDM support are currently running, and this has been recognised by the RDM community and by politics to foster a more intense exchange of experiences and cooperation between the individual initiatives. Currently, a national research data infrastructure initiative (NFDI) supporting selected scientific communities with an appropriate funding scheme is in development.[7] This NFDI is supposed to interface with international developments such as the European Open Science Cloud (EOSC).[8] The challenge concerning these (inter)national developments is to build interfaces to local research communities at the individual universities.

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1   https://www.dfg.de/download/pdf/foerderung/antragstellung/forschungsdaten/guidelines_research_data.pdf [Last accessed 21 December 2021].

2   https://www.dfg.de/foerderung/programme/koordinierte_programme/sfb/antragsteller/programmelement_inf/index.html [Last accessed 21 December 2021].

3   http://www.eresearch.uni-goettingen.de [Last accessed 21 December 2021].

4   https://bwfdm.scc.kit.edu/ [Last accessed 21 December 2021].

5   https://www.uni-marburg.de/de/hefdi [Last accessed 21 December 2021].

6   https://www.fdm.nrw/ [Last accessed 21 December 2021].

7   https://www.nfdi.de/ [Last accessed 21 December 2021].

8   https://www.eosc-portal.eu/ [Last accessed 21 December 2021].

From an infrastructure provider perspective, the interplay of organisations like the library, the computing center (IT, scientific computing), and the research office to provide effective and efficient support for the researchers is of central relevance. Here, a trend from services to partnerships appears to emerge, and the boundaries between the infrastructure providers become porous (in terms of expertise and services). Building trustful relationships seems to be a very central aspect, and the concept of an integrated 'Third Space' might be applied (Verbaan & Cox 2014). Building a (local) community of Data Champions and Data Stewards is one possibility for building trustful relationships (Plomp et al. 2019).

These considerations become particularly interesting in the present case, in which there is a very distinct culture of decentralised organisational structures in one of Germany's largest universities. This contribution is laid out as follows. It begins by introducing the University of Cologne (UoC) and the current situation regarding RDM. After a brief account of a feasibility study on a centrally coordinated RDM (Dierkes & Curdt 2018), we present and discuss our approach to develop and implement an agile, centrally coordinated, university-wide RDM support infrastructure.

THE UNIVERSITY OF COLOGNE AND ITS RESEARCH LANDSCAPE

Founded in 1388, the UoC is the second-oldest German university, after the Ruprecht-Karls-University of Heidelberg, and one of the oldest universities in Europe. With around 50,000 students, the UoC is also the second-largest university in Germany. Around 5000 academic staff (including professors) and around 3500 technical and administrative staff work at the UoC (status 2020).[9] The UoC is one of the leading research universities in Germany. Organised in six faculties, the UoC covers a broad spectrum of disciplines, including art and humanities, mathematics and natural sciences, human sciences, economics and social sciences, law, and medicine. The main research focus of the UoC is on several large and internationally competitive areas. Well-developed key profile areas include ageing-associated diseases, social and economic behaviour, quantum matter and materials, plant breeding research, and socio-economic, cultural, and political change in the Global South (Africa, Latin America, and Southeast Asia). In 2012, the UoC was successful in the German Excellence Initiative[10] of the German federal and state governments, which enabled the UoC to strengthen these research focus areas. The UoC has a close cooperation with the Cologne University Hospital as well as with several renowned universities and non-university research institutions in the Cologne metropolitan area (e.g., RWTH Aachen University, University of Bonn, Max Planck Society, Helmholtz Association, and Leibniz-Society).[11] At the end of 2019, the University of Cologne was a founding member of the European University for Well-Being (EUniWell), which unites the top-ranking European universities of Birmingham, Florence, Cologne, Leiden, Linnaeus, Nantes, and Semmelweis in a European university alliance.[12]

The UoC has historically developed in highly decentralised structures. Over the last decade, the organisation of six strong, independent faculties has evolved. The decentralisation is reflected, for instance, by a very pronounced two-layered library structure. Likewise, IT infrastructures and resources have also developed in a decentralised manner.

In recent years, decentralised structures have also been formed with respect to RDM activities, solutions, and competencies at the UoC (Dierkes & Curdt 2018). Various approaches have arisen within the framework of various research projects. Additionally, broader structures and measures on the institutional or faculty level have been established. For example, on the faculty level, the Faculty of Philosophy has assumed a pioneering role in the development of decentralized RDM structures within the UoC. The Data Center for the Humanities (DCH)[13] was established by the Faculty of Philosophy as a service for its scientists, to advise and support them with respect to data management planning within the project application. At other faculties, isolated solutions for technical RDM infrastructures were set up over the last few years. Additionally, on

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9   https://strategy.uni-koeln.de/strategisches_controlling__informationsmanagement/zahlen_i_daten_i_
fakten/index_ger.html [Last accessed 21 December 2021].

10   http://www.dfg.de/en/research_funding/programmes/excellence_initiative/index.html [Last accessed 21 December 2021].

11   https://www.portal.uni-koeln.de/uni-forschungsprofil.html [Last accessed 21 December 2021].

12   https://www.euniwell.eu/ [Last accessed 21 December 2021].

13   http://dch.phil-fak.uni-koeln.de/ [Last accessed 21 December 2021].

a project consortium level in various faculties, RDM support infrastructures were established for large-scale research projects such as Excellence Clusters, Collaborative Research Centres, and so forth (e.g., Stamnas et al. 2016; Curdt 2019).

ESTABLISHING A UNIVERSITY-WIDE RDM SUPPORT AND SERVICE INFRASTRUCTURE AT THE UOC

At the UoC, there has so far been no systematic, university-wide discussion about RDM. However, a need for action becomes obvious when one considers the networking and synergy potential together with the various recommendations and guidelines for dealing with research data. Thus, at the end of 2016, the Rectorate of the UoC commissioned a one-year feasibility study on RDM. The aim was to determine the status quo and to develop concepts for a university-wide RDM support infrastructure. The Department for Research Management of the University Administration (D7), the Regional Computer Centre (RRZK), and the University and City Library (USB) of the UoC are collaborating in this project. The project reports to a steering committee chaired by the Vice-Rector for Research. The other committee members are the Vice-Chancellor, the Research Deans of the six faculties, and the heads of the three participating institutions. The project team comprised employees of the project partners.

As a result of the feasibility study, a concept for a permanent university-wide RDM was developed based on the experiences of other German universities and relevant recommendations. The concept focuses on broad generic services with the priority to raise awareness among researchers and central and administrative organisations of the UoC. Consequently, it was the first milestone to adopt a university-wide research data guideline and thus to develop a university-wide data strategy. Prior to the publication in January 2018, the guideline was discussed in an iterative process with the steering committee and representatives of the six faculties, as well as the Rectorate and Senate. Additionally, a possible RDM service portfolio was developed, and a catalogue of measures was derived to establish university-wide RDM support and services as described in detail in Dierkes and Curdt (2018). At the end of 2018, the Cologne Competence Center for Research Data Management (C³RDM)[14] was founded and is still in the development phase to provide the university-wide RDM services. Moreover, a proposal for an initial organisational RDM structure for the UoC (Figure 1) was developed.

In a dedicated workshop, the project team and the steering committee came to an agreement about the concept for the organisational structure at the UoC. To set up and establish a university-wide RDM service, it is necessary and useful to integrate existing and historically grown infrastructures. Exchange, integration, coordination, and cooperation with these infrastructures is essential. Corresponding interfaces and workflows need to be created. Multiple work and parallel structures should be avoided. Instead, synergies should be created between the various infrastructures and stakeholders. Thus, further exchange platforms and events will be put into practice. The new structure should bundle existing services and expertise effectively and make them available for all researchers of the UoC as central and generic services. Thus, central elements of the proposed new RDM structure at the UoC are the central RDM competence centre, the expert network, a forum research data, and the faculties with their decentralised, subject-specific RDM solutions and offers.

The C³RDM has already started to establish an RDM framework to support a central entry point to the topic. Additionally, it serves as a broker for the existing offers. The Steering Group of the C³RDM guides and decides about the strategic development and must be accordingly informed about further steps and improvements. A network of RDM experts of the faculties such as members of the Data Center for the Humanities (DCH)[15] of the Philosophy Faculty, is currently being formed. The central RDM and the expert network foster the development of common workflows (e.g., RDM consulting, training courses) and interfaces that are already being discussed in regular meetings (e.g., Dierkes & Helling 2020). Moreover, a forum research data will be established for delegates of RDM-related areas of the UoC (e.g., data managers of research projects, other interested parties). This forum will serve as an exchange and cooperation platform for RDM topics and should be a kind of incubator for future developments in the field. With both networks, different exchange formats are currently being established.

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14   https://www.c3rdm.uni-koeln.de/ [Last accessed 21 December 2021].
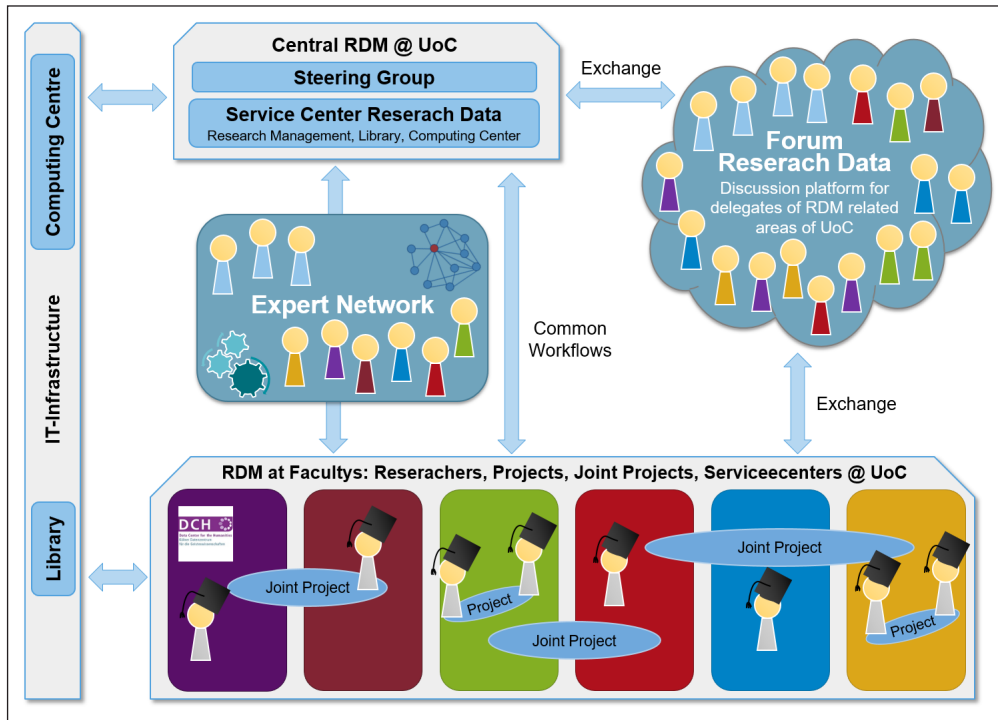
15   https://dch.phil-fak.uni-koeln.de/ [Last accessed 21 December 2021].

Measures to establish the internal networking activities focus on six main areas: regular exchange with cooperation partners, individual exchange with projects and centres, networking with infrastructure initiatives and projects, organisation of networking events, presentation in university committees, and implementation of discussion rounds and exchange formats for cross-disciplinary RDM topics. So far, some networking and discussion platforms have been established. A monthly Jour fixe meeting between C³RDM, the members of the DCH of the Philosophy Faculty (Dierkes & Helling 2020), and the RDM experts from the medical faculty was established for the purpose of networking as well as exchanging current topics on joint consulting cases and training courses. Moreover, several networking events and exchange platforms have been organised and formed. For example, a networking event was organised with a focus on the national research data infrastructure initiative (NFDI)[16] and the planned activities at the UoC. The NFDI is now under development with a number of contributions by the UoC.[17] Another event was conducted to link the faculties' ethics commissions and the UoC data protection officers to discuss cross-faculty topics on the handling of sensitive and personal data. From this activity, a regular cross-faculty exchange meeting evolved. Recently, the successful concept of a data champion network by Savage and Cadwallader (2019) was adopted, allowing for the emergence of a community of practice around RDM.

Additionally, the C³RDM regularly invites members of our research forum and expert network to participate at networking meetings organised by the RDM state-wide initiative of North Rhine-Westphalia (FDM.NRW).[18] On a monthly basis, innovative topics and current developments in RDM in NRW and beyond are presented and discussed. A joint virtual participation of all university members in the computing centre enables an exchange and discussion platform. For the future, more regular Jour fixe meetings with a selected RDM-related audience, RDM lunch/cafe meetings, joint training courses, and lecture series with an RDM focus are planned.

Additionally, further services will be developed together based on the specific needs of the researchers. The central IT infrastructures (Computing Centre and Library) are part of the central RDM and will continue to support the faculties with existing and new services and offers, such as supporting the technical requirements and storage capacities.

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16   https://www.nfdi.de/?lang=en [Last accessed 21 December 2021].

17   https://fdm.uni-koeln.de/netzwerkuzk/nfdi-uebersicht [Last accessed 21 December 2021].

18   https://www.fdm.nrw/index.php/veranstaltungen/jour-fixe-fdm/ [Last accessed 21 December 2021].

DISCUSSION

We have presented RDM in the context of an institutional (university) setting. RDM support at the university level can be implemented in very diverse ways at universities, Likewise. motivations and reasons for implementing RDM services can vary (Akers et al. 2014). There are many stakeholders within organisations. It has been observed by Mathiesen, Jamtveit, and Sneppen (2010) that there is a kind of 'divergence of information' across the hierarchical structure of a university. Along with the complexity of the problem, the first major challenge for a central RDM initiative is to disseminate comprehensive information and raise awareness about the topic. The next step is to establish a dialogue, which allows the different perspectives of the individual parties on RDM to become apparent (cf., Calton & Payne 2003). The initial dialogue started with setting up a pilot project; bringing together the library, the computing center, and the Department for Research Management; and setting up project governance that included a representative of the Rectorate (the Vice-Rector for Research), the Vice-Chancellor, and the Vice-Deans for Research of the Faculties. This maps the hierarchical organisational structure and is very important, as leadership support is one key in establishing such a university-wide infrastructure (rather on a funding and policy level). A second track, at least as important, is to bring those stakeholders (parties) together that are more directly affected by the developments, that is, those people and units that implement RDM, such as researchers, data managers, administrative staff, IT staff, library staff, and the like. At this level, an expert (knowledge) network, communication networks, service portfolios, demand, workflows, agreements, and so on can be established. At this stage, we focus on means of communication to foster sense making and collaboration. An example for the 'hierarchical track' is the introduction of a university-wide research data guideline (Dierkes & Curdt 2018).[19] In a quite traditional approach, there were a couple of iterations with representatives of each individual faculty followed by a vote by the Senate and the signing by the Rectorate. Together with the funding of the project through the Rectorate, these correspond to an official commitment by the university for supporting RDM, though implementing the policy at the university and providing the appropriate and required infrastructure will take some time and effort and may also cause challenges, as also discussed in Fitt, Rouse, and Taylor (2015).

While building the competence center, we first focus on consulting and supporting research projects. Examples for the 'implementation track' are developing training courses on RDM for PhD students in collaboration with the graduate schools and the networking of RDM experts[20] in the faculties, on research projects, and in other academic units (cf., Dierkes & Wuttke 2016), disseminating data practices and raising awareness of overlapping aspects of RDM (e.g., organisation, metadata, licences, costs). An information platform is furthermore important to make the personal networks, which carry tacit knowledge more explicit and useful (cf., Hagel, Brown & Davison 2012). The emerging roles of data stewards and networks of data champions have the potential to foster exchange and common learning as well as to act as agents of change of the local code and data management culture (e.g., Plomp et al. 2019).

CONCLUSIONS

RDM and its supportive infrastructures can be recognised as a complex problem to which organisations and RDM stakeholders can often only find 'clumsy solutions'.

The feasibility study has shown that there is currently a bumpy landscape of RDM procedures and initiatives across the university. The university leadership and the faculties (i.e., the researchers, represented via the steering group of the RDM feasibility study) acknowledge the development of an RDM competence center. A three year set-up phase has been funded by the university. The Cologne Competence Center for Research Data Management (C³RDM) is constituted by the University and City Library, the Regional Computing Center, and the Department for Research Management, with the aim of both providing generic RDM support (consulting, training, basic digital infrastructure) and establishing an adaptive and sustainable infrastructure (cf., Hagel, Durchslag & Brown 2002).

19   https://am.uni-koeln.de/e21463/am_mitteilungen/@6/AM_2018-07_Leitlinie-zum-Umgang-mit-Forschungsdaten_ger.pdf [Last accessed 21 December 2021].

20   With RDM experts we refer to any person who has advanced knowledge (incl. tacit knowledge) on aspects related to RDM.

To tackle the complex problem of RDM in large university environments such as the University of Cologne, transparent and fluent communication structures are needed to constantly negotiate the dynamics between service providers, decision makers, and researchers from different areas of studies. An expert network and a forum research data will therefore be established. Raising awareness among all stakeholders for the needs, benefits, and challenges of RDM services to researchers, faculties, administrative personnel, and the university leadership is a key challenge in fostering acceptance among a large university audience and establishing a constant dialogue. This will be accompanied with the implementation of workflows between the RDM support infrastructure actors (central and decentralized).

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COMPETING INTERESTS

The authors have no competing interests to declare.

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