PRACTICE PAPER

# Landesinitiative NFDI – a Central Point of Contact for RDM for Higher Education Institutions in the German State of North Rhine-Westphalia

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This paper gives an overview of activities regarding RDM in Germany including the national political context as well as initiatives on federal state level. The knowledge about Germany's federal system, which also entails the autonomy of the federal states regarding the higher education system, is fundamental to understand the different approaches towards RDM in Germany. The state initiatives of Thuringia, Baden-Wuerttemberg and Hesse are described to compare them to the state initiative (Landesinitiative NFDI) of Germany's most populous state of North-Rhine Westphalia (NRW). The aim of the initiative in NRW is to initiate the collaboration between institutions, to link current RDM activities in NRW and to prepare the local institutions for the participation in a National Research Data Infrastructure (Nationale Forschungsdateninfrastruktur, NFDI).

## Introductions

Research data management (RDM) addresses one of the major challenges within the digitalisation of research processes. Data is becoming a more and more valuable resource and the demands regarding its handling are constantly rising: storage (of big data), legal issues, data sharing, virtual collaboration as well as long term preservation – to name just a few – are important aspects of RDM, which need to be addressed. These challenges require not only individual solutions of scientists and universities but joint efforts on an international, national and – in Germany's case – federal state level to build a basis of technical infrastructure as well as a network of support and services scientists can rely on. This article describes the current developments regarding RDM in Germany and especially in the federal state of North-Rhine Westphalia (NRW), where the *Landesinitiative NFDI* is located.

## RDM in Germany – Towards a National Research Data Infrastructure

Already in 2014, the European Commission recognized the need to support the data revolution by launching the European Cloud Initiative (EC 2016a). The idea behind the European Cloud Initiative is to provide science, industry and public authorities with 'world-class digital infrastructure that bring state of the art computing and data storage capacity to the fingertips of any scientists and engineer in the European Union' (EC 2016b). Focussing initially on science, it will especially endorse Open Science. For this, a Commission High Level Expert Group on the European Open Science Cloud (EOSC) was launched in 2015 to advice the European Commission. The realisation of the European Cloud Initiative will be based on the European Data Infrastructure (EDI), which consists of already existing and developing e-infrastructures for data handling (supercomputing capability, high-speed-connectivity, data and software services) among the 28 member states of the European Union. Germany contributes to the European Cloud Initiative on several levels: By participating in the development of European e-infrastructures that surely will be integrated into the EDI (e.g. EUDAT), by having representatives at the High Level Expert Group on the European Open Science Cloud

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and especially by setting up the International Support and Coordination Office (ISCO), an international office to support the GO FAIR Initiative.

In Germany this European initiative is reflected within Germany's 'Digital Agenda' (BMWi 2014), where the government expressed its support of the digitalisation in Germany. The Digital Agenda was published in 2014 and formulates fundamentals of digital politics in Germany, which stimulated the discussion about the chances for digitalisation in the German Higher Education System. Based on this political impulse, the German Joint Science Conference (Gemeinsame Wissenschaftskonferenz, GWK) convened the Council for Scientific Information Infrastructure (Rat für Informationsinfrastrukturen, RfII) in 2014. The Council is a highly ranked committee consisting of scientific users, members of information facilities, as well as representatives from public life and the federal and regional government. Its aim is to provide impulses and stimulate the discussion about RDM in Germany. In 2016, the RfII published its comprehensive and often-cited report 'Enhancing Research Data Management: Performance through diversity. Recommendations regarding structures, and financing for research data management in Germany' (RfII 2016). In this report, the Council endorses a national research data infrastructure (**N**ationale **F**orschungs**d**aten**i**nfrastruktur, NFDI). The NFDI shall consist of a nationwide network of competence as well as of a sustainable, interoperable information infrastructure for research data which fosters further development and provides new and existing services from storage and archiving of research data to service and guidance. The council demands new job profiles, like data scientists and data librarians, and asks for a change of culture and teaching within a transition process of 15 to 20 years. The service level of the NFDI shall cover demands and needs of the different scientific disciplines and shall be developed strictly science-driven in a 'bottom-up' process. Scientists are supposed to join their forces with partners from infrastructure (e.g. libraries, IT centers and research offices) in nationwide consortia, for which the council requests sustainable funding.

At the same time, RDM services need to build on reliable and sustainable IT infrastructure which is hosted at universities and research institutions. The development of isolated solutions for IT infrastructure is not very efficient, there is a need for collaboration and joint activities in the context of RDM. However, Germany-wide activities in university infrastructure are challenging to establish because the individual German states are responsible for the legal foundations, the political boundary conditions and the basic funding of the universities. There is no central authority to initiate top-down activities on RDM on the political level so that the coordination of RDM processes is mainly driven by the individual German states. And even within individual German states the establishment of shared infrastructures is a challenge because of the legal boundary conditions which foster individual freedom of the universities.

## RDM state initiatives in Germany in the Framework of the German Federal Higher Education System

Germany comprises 16 German states, which vary in geographical size and density of population. The number of inhabitants in the German states range from 680.000 in the German state of Bremen up to about 18 million in NRW. With the size of the individual German states also the size of the higher education systems vary. More than 2,8 million students are enrolled in Germany's higher education institutions, thereof 770.000 in NRW – the German state with the highest number of students (Statistisches Bundesamt 2018). The tertiary education sector in Germany comprises 429 higher education institutions including 106 full universities and 218 universities of applied sciences.[1] Their distribution within the German states varies from 5 higher education institutions in the German state of Saarland up to 77 in the German state of Baden-Wuerttemberg.

On the political level, the higher education system in Germany is marked by a federally structured division of responsibility for education, i.e. each German state has an individual Higher Education Act, which defines the legal foundations and political boundary conditions in each state. Also, the basic funding strategies of the universities differ in the individual German states and so do the basic conditions for the development of RDM services at university level.

Currently there are four German states which are fostering RDM activities on federal state level. The different initiatives vary in scope and approach.

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[1] The German tertiary education sector comprises full universities, universities of applied sciences as well as other types of universities with of topical focus in specific fields, e.g. arts and music, administration or church universities. Universities of applied sciences have a focus in teaching and usually perform research in areas of applied science (e.g. engineering, technology or business) and often in collaboration with regional partners (e.g. from industry). Universities of applied sciences can award doctoral degrees only in collaboration with full universities.

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### The German State of Hesse

The higher education sector of the German state of Hesse comprises about 260 000 enrolled students (i.e. about 9% of Germany's total number of students) at 30 higher education institutions, thereof five full universities and six universities of applied sciences.[1]

To foster RDM activities in Hesse, the HeFDI initiative is funded by Hesse's Ministry for Science and Arts with 3,4 Mio Euro between 2016 and 2020. The work of HeFDI builds upon the work of a local RDM center of competence at the university of Marburg, which was funded by the state ministry from 2013 to 2015 and can be considered as a pilot project for the joint RDM activities in Hesse. The main goals of HeFDI are the establishment of RDM policies, RDM training offers, advice for researchers regarding data management plans, legal issues, licensing and tools in the framework of data as well as shared infrastructure and repositories at the participating institutions.

The HeFDI project is realised by a total of nine RDM experts at the individual institutions. The work of the RDM experts – distributed among the higher education institutions in Hesse – is accompanied by a central coordination, hosted at the university of Marburg. The governance of HeFDI follows a middle-out model, i.e. different decision-making levels at the participating institutions are involved from the operational level through the executive boards of the participating universities to feedback from the ministry (Brand, Stille, Schachtner 2018).

### The German State of Thuringia

In the German state of Thuringia 13 universities are located, including 4 full universities and 6 universities of applied sciences.[1] With about 50 000 students (i.e. about 2% of Germany's total number of students) Thuringia is one of the smaller German states.

By the end of 2018, a network of competence for RDM at the universities of Thuringia is starting its work, funded with about 400 000 Euro for two years by the state of Thuringia and coordinated by the university of Jena. The key element of this network is the establishment of a common RDM advice service for researchers of the different disciplines. For this, each of the four full universities in Thuringia will host an RDM expert with a focus on consultancy regarding the research focus of the respective university. Further aims of the project are the establishment of RDM policies, the development of shared IT-infrastructure like a common virtual working environment for scientists and the further advancement of the offers of the Digitale Bibliothek Thüringen (Digital Library Thuringia) regarding research data deposit as well as the long-term preservation service of the IT-Dienstleistungszentrum Thüringen (IT service center Thuringia).

### The German State of Baden-Wuerttemberg

In the German state of Baden-Wuerttemberg more than 360 000 students are enrolled (i.e. about 13% of Germany's total number of students) at 77 higher education institutions, which include 12 full universities and about 50 universities of applied sciences.[1]

In the German state of Baden-Wuerttemberg the project bwFDM-Communities, funded by the state's Ministry for Science, Research and Arts during 2014 and 2015, performed a comprehensive survey (627 interviews) of the demands of scientists in the context of RDM. In the following phase of the project (bwFDM-Info, 2016–2019) emphasis was put on the distribution of information and material about RDM to the German scientific community, realised by establishing the web platform forschungsdaten.info. In addition to these central activities, the ministry awarded grants for RDM projects in a bottom-up procedure: seven projects addressing the challenges along the data life cycle are funded with about 3 million Euros between 2016 and 2019. During the same time period six projects regarding collaborative research environments were granted. Currently there is an ongoing call for Science Data Centers from the ministry of Baden-Wuerttemberg with the application deadline in September 2018. These Science Data Centers shall establish networks of competence for fostering new approaches regarding data and will be carried out by different universities across Baden-Wuerttemberg.

### The German State of North-Rhine Westphalia

North Rhine-Westphalia (NRW) is the German state with the highest population throughout Germany. Unsurprisingly, the tertiary education sector in NRW is large and comprises approximately 770 000 students enrolled at 71 higher education institutions, which include 14 full universities and 16 universities of applied sciences.[2] About every 4th student (28% of the total number) throughout the German country is

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[2] The tertiary education sector in NRW comprises 14 full universities, 16 universities of applied sciences, seven universities of arts and music, five universities of administrative science and 28 private or church universities.

enrolled in NRW and over 50 000 employees are working in scientific or artistic positions at universities in NRW (MIWF 2017). Thus, the size of tertiary education in NRW is similar to those of other medium-sized European countries.

The establishment of common RDM activities and infrastructures in the German state of NRW with its large and heterogeneous tertiary education sector is a challenge addressed by the work of the Landesinitiative NFDI.

## The Landesinitiative NFDI within the RDM landscape of the German State of North Rhine-Westphalia (NRW)

The Higher Education Autonomy Act (Hochschulfreiheitsgesetz) in NRW stipulates that the universities in NRW are self-governing organisations and thereby free to develop own individual approaches in the context of building up infrastructures, such as for RDM. The status of RDM at universities in NRW is therefore quite heterogeneous – some universities are already on their way to implement institutional RDM services and are surveying the demands of their scientists, have published RDM-policies, are building up data and service centers or start to implement institutional data repositories. Others are just getting on their way. Especially small universities of applied sciences are entering unknown territory and desire support in the process of developing and implementing an RDM strategy.

First efforts for collaboration in the sector of information infrastructure is made: Three consortia of universities in NRW are currently applying for grants for new storage infrastructure, which in a first stage aim to cover the demand for storage for all full universities and in a second stage aim to cover the demand of all universities within NRW. For the long-term availability of research data the federal government of NRW funded a common license for the 'Rosetta' software of the Exlibris group for universities in NRW. A collaborative working environment for research data is developed in form of the campus cloud 'sciebo' by the university of Münster and made available to all universities in NRW (see also López, Vogl & Roller 2017). Further RDM projects funded by varying sources are carried out by different partners in NRW. In addition, several universities are starting to employ data managers and RDM experts at their institutions, which are building up local RDM competence. Thus, there is a great demand for knowledge exchange between the individual institutions and RDM projects in NRW.

To stimulate the coordination of the different RDM activities in NRW, the Landesinitiative NFDI, as a central point of contact for universities in the context of RDM, is funded by the Ministry of Culture and Science of the Federal Government of NRW and the Digitale Hochschule NRW (DH-NRW) with about 400 000 Euro for two years. The DH-NRW is a federation of 42 universities[3] with participation of the Ministry of Culture and Science of the German state of NRW with the aim to promote digitalisation in research, teaching and infrastructure and to foster collaboration between the participating institutions. The project team of the Landesinitiative NFDI reports to the program committee of the DH-NRW, which can be considered as the 'think tank' of the institution and comprises vice presidents and CIOs of the participating universities. The Landesinitiative NFDI is supported by a group of RDM experts with various institutional backgrounds including research libraries, IT centers, research support offices, and extramural research institutions. The RDM expert group comprises ten representatives of different types of higher education institutions and non-university research institutes. Their input is pivotal for gaining insights into the demands concerning RDM at the different institutions as well as for gathering information on current developments in the state of NRW. In September 2017, the project Landesinitiative NFDI, located at the university library of the University of Duisburg-Essen, officially started with a project team of three persons.

The activities of the Landesinitiative NFDI are based on the work of the former 'Fachteam FDM' of the DH-NRW, which consisted of six RDM experts from scientific libraries and IT centers who drafted a pilot study on the status of RDM in NRW (DV-ISA 2016). With the establishment of the Landesinitiative NFDI the group was extended to the current RDM expert group.

## Landesinitiative NFDI – Goals and Tasks

The Landesinitiative NFDI is to accompany joint RDM projects in NRW and to interconnect the RDM experts at the individual institutions. In addition, the Landesinitiative NFDI is to support the participation of partners and institutions in NRW in the development of a Germany-wide National Research Data Infrastructure (Nationale Forschungsdateninfrastruktur, NFDI).

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[3] 14 full public universities, 16 universities of applied sciences, seven public universities of arts and music and five universities of administrative science are organised within the DH-NRW.

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The aims of the project can be assigned to two columns: Firstly, the strategic development which aims to position NRW within the national context of RDM and prepare institutions and scientists for a participation in the NFDI (A). In this process, the Landesinitiative acts as intermediary between federal state and national activities. Secondly, the Landesinitiative provides basic services for universities on an operative level for building up institutional RDM-services (B).

## A) Strategic development
### Accompany common RDM activities in NRW
The Landesinitiative NFDI supports and accompanies the establishment of new RDM services in NRW such as the pilot phase and roll-out of a common software for long-term archiving (Rosetta) or the common application for storage infrastructure and further projects in the context of RDM on a conceptual level. In this context, the Landesinitiative NFDI moderates workshops, mediates between local partners and the ministry and initiates communication processes. A statement that reflects the role of higher education institutions in the development of the NFDI from an institutional point of view was published (Curdt et al 2018).

### Prepare scientists and institutions for the participation in the NFDI
Although the NFDI is of high political and strategic relevance and is to be built 'bottom-up', scholars and scientists are often not yet familiar with the idea of the NFDI and its further implications. The Landesinitiative NFDI tries to raise awareness among scientists in NRW for the planned NFDI and identifies scientists who are possible candidates for the formation of consortia. In this important process, the Landesinitiative NFDI tries to stimulate exchange between specialised scientists and moderates workshops to support coordination and communication between them.

### Interconnect and support players in RDM
To interconnect and support institutions and their representatives in building up RDM structures, a regular monthly networking event (Jour Fixe FDM) is organised, which already took place 18 times. The Jour Fixe FDM mainly addresses RDM-experts and interested employees from infrastructure facilities, e.g. libraries and IT centers. Usually there are two short talks on different topics given which then leave enough time for discussion and networking in a casual atmosphere. The possibility to take part via web- or videoconference became an important measure to connect people on a regular basis and make the event as accessible as possible.

Workshops for scientists dealing on special RDM topics like RDM tools are organised as well. So far a workshop on electronic lab notebooks attracted around 80 scientists. Another workshop on research data in the science of history took place and further workshops on musicology and digital humanities are planned. The cooperation with experts and specialised institutions proved to be a door-opener to connect with leading scientists and RDM service providers to get insights into the demands of scientific users.

### Trendscouting
The Landesinitiative NFDI monitors RDM initiatives on international, national and federal state level to scout current trends in RDM, to keep an overview of RDM activities and to gather experience and knowledge on RDM processes and needs. Trendscouting includes the regular participation in RDM conferences and workshops and scientific conferences that have a focus on data.

## B) Basic support services for universities in NRW
### Instruments for implementing RDM at institutions
Different instruments are provided to support universities to implement their own RDM strategies. A template RDM policy (Grasse, López, Winter 2018) was sent to the university steering committees (vice presidents for research) together with accompanying material: a Quick-Start-Guide for the implementation of the guideline providing more contextual information and postcards for RDM awareness. The RDM policy was developed following the LEARN RDM template policy (LEARN 2017) and translated into German and adapted to the conditions present at German universities. The demand for a template policy was formulated by representatives of the universities because only a few among them had published an RDM policy in 2017. Depending on the status quo of RDM activities at the universities, the template policy can either be used for a revision or a specification of an existing guideline, can support in the development of a new policy, can initiate the process or just create awareness for the importance of RDM.

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### Information and support

On demand, the Landesinitiative NFDI offers introductory lectures on RDM to raise awareness for the topic among scientists or other stakeholders. The Landesinitiative NFDI works close together with the infrastructure partners of the institutions and offers support when no local services are available.

The preparation of further RDM awareness material (e.g. posters, flyer) as well as information material (e.g. handouts on legal issues, template RDM policies for faculties and research departments) for free use of the participating institutions is planned.

## Conclusion

To foster RDM activities and implement RDM procedures into the research life cycle, a mere focus on technical solutions is not sufficient. An investment in (well trained) people, service orientation and communication is crucial for its success. Institutions need to collaborate in order to meet the challenges of digitalisation. For this, efforts are made by the national German government with the aim to establish a country-wide national research data infrastructure (NFDI) as well as by the federal German states establishing RDM state initiatives with varying approaches. While the German state of Hesse, Thuringia and Baden-Wuerttemberg are funding RDM experts or RDM projects along the data life cycle at different universities, accompanied by a central coordination, the German state of North Rhine-Westphalia (NRW) bets on a central coordination of the heterogeneous RDM activities in NRW by the Landesinitiative NFDI, accompanied by a basic funding for technical infrastructure.

In the German state of NRW, in which the autonomy of the universities is deeply rooted in their tradition and strongly supported by the legal boundary conditions, the value of an initiative that brings different stakeholders together cannot be underestimated. With its main tasks in networking, coordination and communication, the Landesinitiative NFDI meets these challenges and accompanies the universities in NRW.

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## Competing Interests

The authors have no competing interests to declare.

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