Rat für Informations Infrastrukturen

December 2018

Wide Impact for Research: NFDI Consortia as Stakeholders

Third discussion paper on the development of a national research data infrastructure (NFDI) in Germany

In April 2017 and March 2018 the German Council for Scientific Information Infrastructures (RfII) published two discussion papers on the objectives and prerequisites for joining a national research data infrastructure and on the development of the NFDI.[1] Researchers, data and information experts, and scientific policy makers wanting to improve the quality and accessibility of research data were thus able to follow the political process on the path to an NFDI. The scientific communities and their infrastructure partners were also able to discuss the topic at an early stage. An important goal in these preparatory discussions should be cooperation scenarios. Discipline or thematically oriented "NFDI consortia" depend on active scientific communities who establish and prioritise their own needs in order to develop, take responsibility for, and operate research data services on this basis.

The Joint Science Conference has reached an agreement between the Federal Government and the *Länder* on the establishment of the NFDI in November 2018. The first call for applications for NFDI consortia is expected in the first quarter of 2019. The German Research Foundation (DFG) is responsible for the application process as well as for assessing the proposals. Already now there is a great need for information and discussion on how to develop a good NFDI consortium and on "how" to form a consortium. This third and final RfII discussion paper therefore points out aspects that, in the opinion of the RfII, are relevant to the preparation of capable NFDI consortia.

WHAT AN NFDI CONSORTIUM SHOULD ACHIEVE

The task of the consortia[2] and the NFDI as a whole is the establishment and further development of comprehensive research data management and increasing efficiency throughout the entire scientific system.[3] This requires the further development and linking of research-oriented data services as well as accepted, standardised processes and procedures for handling research data in the scientific disciplines. Combining these two requirements is the task of the

[1] Cf. Rat für Informationsinfrastrukturen (RfII): Schritt für Schritt – was bringt wer mit? (2017). Available online at http://www.rfii.de/download/rfii-diskussionspapier-2017/ (German only); RfII: Zusammenarbeit als Chance (2018). Available online at http://www.rfii.de/download/rfii-diskussionspapier-maerz-2018/ (German only). It is recommended to read all three catalysts for discussion.

[2] NFDI consortia are nationwide networks in Germany that work together to conceive and develop a service portfolio oriented towards substantive and methodological research questions with long-range planning for entire thematic domains.

[3] Cf. Joint Science Conference (2018): Agreement between the Federal Government and the *Länder* concerning the Establishment and Funding of a National Research Data Infrastructure (NFDI) of 26 November 2018, p. 2.

NFDI consortia. They are exchange forums mandated by science itself and promote harmonisation and data culture in research data management. They could also be a voice articulating data policy needs from a scientific perspective at the interfaces to the economic sector and society.

This results in requirements for the establishment and governance of the consortia. Researchers not only contribute to the NFDI consortia as users of services, but as co-responsible developers. This is reflected (in the NFDI) in the governance of the NFDI consortia and also in participation measures for standards and prioritisation and path decisions. In particular, the tasks of a consortium include organising the ability to speak and act with respect to the research data services to be developed. NFDI consortia may allocate resources for this purpose. This requires a conceptual approach that includes sufficiently specific, realistic measures appropriate to the domain and its typical methods/forms of research and that is demonstrably discussed and broadly anchored in the corresponding scientific community.[4]

An NFDI consortium "is" therefore a structure that enables sustainable research processes through the continuous development of suitable services, and not just a location (a repository or a similar facility) for storing data. In terms of the service portfolio of a consortium (see below), the actual scale (and range) of scientific needs is the measure of all things. This means that even the "initial formation" of an NFDI consortium should already bring together people representing typical research questions and data production methods as well as typical levels of methodological knowledge and infrastructure expertise. Consortia should also demonstrate as specifically as possible how they will deal with the divergent requirements of data users and data producers whose interests are by no means always identical.

ON THE INVOLVEMENT OF USERS

The NFDI as a whole as well as NFDI consortia have a high degree of communication activities, and need to organise these in a long-term perspective. Periodically attracting attention to the NFDI process is relatively easy to realise in scientific communities through events, papers, etc. Temporary 'peaks' of attention can be expected in conjunction with the NFDI application and selection process. A much greater challenge is the *continuous* as well as *structural* (namely: effective, with a voice) integration of the researchers who use the services. They are the ones who determine how valuable a service is, and they need to be integrated into the NFDI at all levels. Within NFDI consortia, the appointment of spokespersons and self-coordination are regulated through a governance structure that includes users in the decision-making process. NFDI consortia ensure that participation appears sufficiently important and rewarding from a researcher's perspective, that researchers will not grow weary of the (continuous) communication and that different groups within the user community have a balanced voice. Measures for integrating users should be included in NFDI applications as reviewable elements.

[4] It is also understood that researchers are under no obligation to submit data to the NFDI and that there are no mandatory standards applying to all researchers. Services and standards must prove themselves based on their quality. Their scientific users will be able to find them because they offer practical assistance.

SIZE AND SHAPE OF THE CONSORTIA

A consortium should be designed so that it creates tangible value in the foreseeable future for a target group that is not too small. The design should not be too specialised or exclusive, and instead must be chosen to ensure integration and be able to cover the existing range and diversity of the selected domain over time. Consortia that try to cover too much ground run the risk of only allowing superficial solutions to be realised or causing integration efforts to fail due to the heterogeneity of the requirements. Borderlines between consortia/domains should be drawn based on the digital needs. This means NFDI consortia are structured based on methods (or forms of research[5]) or on the basis of an elective affinity due to having comparable needs rather than based on "disciplines" in the strict sense, individual objects, or existing data collections (such as currently prominent repositories, corpora, or editions).

Initiative should be taken by existing self-organisation bodies (e.g. scientific societies), as well as expert forums, platforms encompassing entire groups of domain specialists, "councils", or sufficiently well-networked and successful joint initiatives of a suitable nature (e.g. collaborative research centres). Institutional stakeholders, universities, and non-university research facilities (members of the Alliance of the Scientific Organisations, departmental research facilities, academies) can and should contribute to scientifically appropriate consortia, or initiate them, if necessary (institutes, project consortia, possibly also professors or other individuals). Other providers and users of services also may be considered as potential partners (museums, collections/archives, research companies, publishers, IT service providers, etc.).[6]

NFDI consortia need to remain dynamic over the long term, expand their focus, and integrate additional stakeholders in order to achieve maximum impact in their respective domains. It is also conceivable that some consortia will prepare for convergence and work towards a merging in the future. Mergers of consortia can also be encouraged in the course of the overall management of the NFDI.

ON DATA CULTURE AND SKILLS DEVELOPMENT

It seems obvious that NFDI consortia should also include consulting services into their service portfolios. However the NFDI overall will generally be organised as part of a network that helps to solve questions relating to data culture and progresses the development of competencies for digital science. The NFDI consortia contribute to this, just like the local stakeholders and the stakeholders in scientific organisations. And they have good reasons for doing this, not only due to their own staffing needs, but also to the advantage of the scientific communities and the infrastructure providers involved. NFDI consortia can for example form partnerships with universities and non-university research facilities, graduate centres, or local and international

[5] Cf. Wissenschaftsrat (2012): Empfehlungen zur Weiterentwicklung der wissenschaftlichen Informationsinfrastrukturen in Deutschland bis 2020 (German Council of Science and Humanities: Recommendations on the Further Development of Scientific Information Infrastructures in Germany until 2020, p. 35ff., German only).

[6] As the RfII has already communicated, NFDI resources do not serve as long-term financing for projects of limited duration, which means sustainable financing is a prerequisite for joining an NFDI consortium.

stakeholders, or they can develop suitable "internal" approaches for staff development, for example by offering internships, courses, or similar training programs.

ON PORTFOLIO DEVELOPMENT

NFDI consortia must succeed in identifying a range of essential services for the participating scientific communities (or at least establish which such services are needed) and ensure their coordinated advancement in line with the requirements of research ("service portfolio"). The NFDI provides layered services, meaning common ("generic") services, and higher level services operated by consortia for specific target groups. A consortium can propose generic services as well as integrate services operated elsewhere (adapted, if necessary). However, it essentially offers its own services under common responsibility, not just a directory of usable software.

In light of the variety of tools and resources available from various locations and operators, the design of a portfolio is a task that demands participation and decision-making processes as well as negotiating skills and integration capabilities. Roadmaps can be useful as tools, but also flexible budgets which are available over the entire term for consented portfolio projects.

To join the NFDI, consortia should reach agree in particular on:

- An assessment of the "digital" needs with a view to the main methods and forms of research used within the particular scientific community or domain, based on specific scientific issues;
- Precise descriptions of the necessary negotiation and rule-making processes and of the relevant services, standards, etc., that shall be established, developed, and addressed within the framework of a cooperation;
- An inventory of existing services (broad and open-minded) or (if already clear) of the services which are to be included in the portfolio: operators, status, and current financing[7]; added value for the scientific community, and possibly the added value for the NFDI (generic services), taking into account the international environment;
- The needs in terms of archiving (in stages, if necessary);
- Strategic approaches for the selection and maintenance of services, as well as the management and development of the particular portfolio and its financing;
- A survey of the stakeholders (institutions, potential groups of data producers and users, etc.) in each domain and their roles – with the objective of networking the activities and approaches across the different "pillars" of the German scientific system.

[7] Information on potentially endangered/abandoned databases and precarious data services are also relevant. NFDI funding is complementary funding for the high quality services required for a transparent overall system (cf. RfII discussion paper "Cooperation as an Opportunity", p. 3f.). In this manner, it is possible to conduct negotiations with funding agencies for basic or otherwise sustainable financing of services and resources brought into the NFDI by each consortium parallel to the formation of the consortia. This applies to computing and storage capacities, for example.

ON THE ROLE OF THE CONSORTIA IN THE NFDI

NFDI consortia contribute individually and in cooperation with other consortia to the further development of the NFDI as a whole. Consortia should also clarify what they can provide for this purpose: What is the added value of individual services to the overall system?

The interaction of consortia will be an important factor in the success of the NFDI. The first objective is to utilise synergies and build a common knowledge base from the experience gained. Furthermore, agreeing on common elements and standards for a federated data landscape in Germany contributes to interoperability and to the consistent and sustainable use of research data in the future – also interdisciplinary and transdisciplinary use wherever science considers it appropriate. Gateways to international networks and in turn design of services for international use and international accessibility are also important elements of their shared responsibility for the future of entire research domains within the framework of the NFDI.

Imprint

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The German Council for Scientific Information Infrastructures (RfII) is a scientific policy advisory board of the Federal government and the *Länder*. During the first term until October 2018 the RfII presented recommendations on structures, processes and financing of research data management in Germany. Related work will be continued in the current term. Furthermore, the RfII will address new issues of e-infrastructure development resulting from changes in disciplinary research cultures. The 24 honorary members are appointed by the Joint Science Conference and work in a honorary capacity.