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Management of research data – a key strategic challenge for university management

HRK German Rectors' Conference

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Summary
The exponential growth, growing complexity and increasing use of digital research data[1] have all had a considerable impact on the process of research in recent years. Examples include the use of methods to manage very large quantities of data due to the exponential growth of digital research data and the development of tools with which to better integrate heterogeneous data. The management of research data, the possibility of data networks, the permanent availability of and ready access to data, all require new and suitable infrastructures.
University management is called up on to provide strategic control of these processes. It is asked to agree guidelines at their universities for dealing with digital research data and to enter into agreements with other universities, non-university research institutions and to support subject-specific data infrastructures. It is the responsibility of university management to improve the information skills of their staff and students and to create a structural framework for the efficient management of research data for the whole institution. The Federal Government and the federal states are called upon to coordinate overarching agreements and measures, which are essential for the development of robust information infrastructures, to span the borders of the federal states. Policy-makers are urged to make additional funding available. The Council for Information Infrastructures, set up by the Joint Science Conference, should assume a coordinating role in close cooperation with the HRK[2].

1. Research data and its changes

Research data has been affected by sweeping changes for some years now.
- The proportion of *digital* research data is constantly growing. Today very significant volumes of research data are in a digital format.
- Digital research data is being produced in exponentially growing volumes ("big data").
- Digital research data is becoming increasingly heterogeneous in its nature and its availability.
- Digital research data is becoming increasing relevant in most disciplines, including the humanities ("e-humanities").
- Digital research data is opening up new research avenues by making a continually growing number of IT tools available.

Research data is essential for researchers. With its digital nature, it allows new processing methods and is changing the opportunities offered by scientific findings and research methods. Through networks, it is having an innovative effect on the dialogue between different disciplines and putting the reproducibility and verifiability of research results on a completely new footing. It is therefore of crucial importance to "good scientific practice".
The efficient handling of digital research data is a key factor in the appeal of a university. University management is therefore called upon

to take responsibility in the future for providing researchers at their university and throughout the German research system with an environment, which allows them to manage digital data efficiently, simply and in a legally secure fashion and thus create the basis for their scientific work. University management should therefore consider the management of digital research data as a key strategic leadership task.

The HRK and its member institutions regard research data and research data management as a particular challenge with which non-university research institutions are confronted to a lesser extent. Unlike these institutions, universities are heterogeneous in terms of subject and organisation. The researchers at a university all have interests in, requirements and knowledge of the use of research data, which are specific to them. At the same time, a university requires integrated (IT-based) and harmonised information management, which is also applied to the handling of digital research data[3].

The challenge of balancing heterogeneity with the necessity for standardisation can only be met if university management assumes responsibility for it. The steps that need to be taken towards a research data management system that will remain viable into the future can only be initiated and encouraged from a position of central leadership. To implement measures in constantly open dialogue with researchers, faculties and departments, administrative personnel and the institutions within the information infrastructure requires appropriate communication and governance structures[4]. The primary responsibility for generating, preparing and backing up their results and data lies with the researchers. This does not change universities' responsibility to make the data available permanently (also after the research project has ended) and to support the network outside of their own institution.

2. The management of research data – a challenge for university management

The heads of the universities need to address the following four essential actions to drive forward the development of a high-quality and sustainable basis for the management of research data at their own universities:

- Agree guidelines on how to handle digital research data

It is of fundamental importance that all those involved at a university (researchers - also those in collaborations, infrastructure, administration and management) develop a shared understanding of the significance of digital research data and how to handle it so that measures to implement an integrated system with which to manage research data can be successful. It is therefore advisable that the above stakeholders agree to an appropriate commitment in the form of guidelines.[5]

- Collaboration beyond the boundaries of the university

Collaboration between universities is essential to ensure that institutional research data management systems can communicate with each other and allow research to be undertaken jointly by different institutions. It is therefore necessary that university management jointly agrees on rules that allow research data to be managed beyond the boundaries of their institutions and which eliminate existing barriers. Collaboration with non-university research institutions and specialist infrastructures is also helpful. The universities should work towards maintaining control of certain central functions in national and possibly international information infrastructures (priority setting) where the activities of non-university research service providers are concerned.[6] It is favourable that research data management is a subject being pursued with great interest at an international level. For example, a report by a High Level Expert Group for the European Commission entitled "Riding the Wave" (2010) has brought the subject to the attention of the scientific public[7]. The European Commission has also made an explicit commitment to *Open Data*. Furthermore, the Europe-wide strategic harmonisation processes should also be considered in terms of digital research data, as evidenced by the activities of the European Strategy Forum on Research Infrastructures (ESFRI).

- Improving information skills
The researchers working at the universities should have fundamental knowledge of data management, as called for by the HRK in its recommendation "Universities in the digital age" of November 2012[8]. These skills can be acquired partly when working with digital research data and partly through training offered by the universities (libraries and computer centres) or by third parties[9].

- Developing institutional infrastructures for research data management
University management is urged to create the structural conditions for an efficient research data management system for use throughout the lifecycle of the data (creation, processing, storing, indexing and archiving). This is not just a matter of providing a technical framework. It is equally important to organise and make transparent the workflows and assignment of roles at the university.

3. Appeal to the Federal Government and the federal states

Given that the importance of digital research data transcends federal and national borders, in the view of the HRK, the Federal Government and the federal states are obliged to make a positive commitment to the development of scientific information infrastructures and thus also the basis for research data management[10]. It appears neither possible nor helpful for individual universities to contribute structure-building measures. It is therefore the responsibility of the Federal Government and the federal states to coordinate firstly agreements and measures (also in terms of standardised legal regulations) which are essential for the development of a robust information infrastructure, initially within

the federal states, and then beyond the borders of the federal states and Germany. The Federal Government and the federal states are also called upon to make additional funding available. The Council for Information Infrastructures, agreed by the Joint Science Conference, will have a coordinating role here in collaboration with the HRK.
The HRK is currently preparing a recommendation in which it is formulating further-reaching proposals on the development of data management from the point of view of university management.

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[1] According to a definition by Maxi Kindling and Peter Schirmbacher, digital research data is "all the data in a digital format, which is created during the research process or is its result. The research process here encompasses the whole cycle of research data generation, from an experiment in the natural sciences, a documented observation in a cultural science or an empirical study in social sciences, to the processing, analysis, publication and archiving of research data. Digital research data is created in every scientific discipline and with different methods, depending on the nature of the research. As a result, it occurs in different media types, levels of aggregation and data formats." (Maxi Kindling, Peter Schirmbacher, "Die digital Forschungswelt" als Gegenstand der Forschung,[The digital research environment as a subject of research] in: Information. Wissenschaft & Praxis 2013, Vol. 64 (2-3), pp. 137-148, here p. 130, online: http://dx.doi.org/10.1515/iwp-2013-0020, all links in this recommendation last tested on 11.04.2014.

[2] This paper was produced by the working group "Future of digital information in teaching and research" under the supervision of Vice-President Prof. Dr. Joachim Metzner. The HRK thanks the members of the AG for their commitment: Prof. Dr. Petra Gehring, Dr. Ulrike Gutheil, Dr. Martin Hecht, Prof. Dr. Wilfried Juling, Dr. Antje Kellersohn, Prof. Dr. Norbert Lossau, Prof. Dr. Joachim Schachtner, Prof. Dr. Peter Schirmbacher, Prof. Dr. Rolf Schwartmann, Prof. Dr. Uwe Schwiegelshohn, Dr. Beate Tröger and Prof. Dr. Martin Ullrich. Editorial responsibility: Dr. Ulrich Meyer-Doerpinghaus (HRK Head Office).

[3] HRK Hochschule im digitalen Zeitalter: Informationskompetenz neu begreifen – Prozesse anders steuern, [Universities in the digital age: A new understanding of information skills - managing processes differently], November 2012 (http://www.hrk.de/uploads/tx_szconvention/Entschliessung_Informationskompetenz_20112012_01.pdf), S. 13f.

[4] Ibid p. 13ff.

[5] While in Germany only the University of Bielefeld has so far passed such guidelines, in the UK many universities have an agreement of this nature: http://www.dcc.ac.uk/resources/policy-and-legal/institutional-data-policies/uk-institutional-data-policies

[6] With this in mind, the German Council of Science and Humanities has called on the "universities to be considered the supporters of information infrastructures on a larger scale, in order to ensure that there are information infrastructures in sectors of the research system" (German Council of Science and Humanities, Übergreifende Empfehlungen zu Informationsinfrastrukturen, [Overarching recommendations on information infrastructures] Berlin 2011, p. 9, online: http://www.wissenschaftsrat.de/download/archiv/10466-11.pdf).

[7] Riding the Wave, How Europe can gain from the rising tide of scientific data. Final report of the High Level Expert Group on Scientific Data. A submission to the European Commission (October 2010): http://cordis.europa.eu/fp7/ict/e-infrastructure/docs/hlg-sdi-report.pdf

[8] HRK, Hochschule im digitalen Zeitalter,[Universities in the digital age] see above, p. 13

[9] For example, from the nestor skills network (http://nestor.sub.uni-goettingen.de/education/index.php)

[10] See also the request made by the German Council of Science and Humanities to the Federal Government and the federal states in July 2012 "to secure sufficient basic financing of the public information infrastructure elements supported by them, particularly the universities" (German Council of Science and Humanities, Empfehlungen zur Weiterentwicklung der wissenschaftlichen Informationsinfrastrukturen in Deutschland bis 2020, [Recommendations on the development of scientific information infrastructures in Germany to 2020], July 2012, p. 8, online: http://www.wissenschaftsrat.de/download/archiv/2359-12.pdf).