

Quality is the Product is the Quality Information Management as a Closed-loop Process

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Summary

When discussing the issue of which criteria should be used to assess the quality of a current research information system, the following aspects are frequently mentioned: How is the assessment's underlying data model conceived? Is the system technically stable? How user-friendly is the design of the user interface and navigation structure? However, another factor is often overlooked: How is the quality of the information provided by a system? From our point of view, it is precisely this quality that is the main factor governing the acceptance and usage, or rather usefulness, of a research information system. It thus deserves particular attention.

This article begins by describing the organisational context, within which the information systems developed by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) are generated. It will then go on to present the "product-governed quality assurance" model. This model was developed with the goal of achieving the highest possible data quality. The principles on which it is based can be generalised and are thus ideally suited to apply to other systems. Taking a practical example, we will then look at the multifactorial approach that characterises this model. Finally, we will look at the future prospects and outline the measures intended to lead to application of "product-governed quality assurance" throughout the entire organisation.

Introduction

The German Research Foundation (DFG) is the main funding agency for basic research in Germany. With an annual budget of approximately 1.8 billion, the DFG funds more than 20,000 research projects in all areas of science and the humanities each year. The DFG's Head Office employs about 700 staff.

Data on the funding proposals submitted to the DFG has been collected electronically ever since the early 1980s, although it was only used for statistical and scientific information purposes until the mid-90s. Since then, a process control application called ElektrA (which stands for "elektronische Antragsbearbeitung", or electronic proposal processing), into which data can be entered remotely, has gradually been developed, and has been used for almost all of the DFG's funding programmes since 2005. ElektrA is thus now used to collect the data needed to process funding proposals by almost all of the departments within the DFG (see also Guedler 2006).

The first and most important effect of the switch to ElektrA was that it became possible to achieve a far greater depth of information as well as a greater degree of differentiation between the information collected. It also led to a significant improvement in the quality of the

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data, with a focus on certain details. With the increase in the number of staff involved as well as the quantity of data itself, it became necessary to draw up rules in order to guarantee the quality of the data collected across all departments. Some of these rules could be implemented technically, for example by using automated plausibility checks in the data collection system, whereas others needed to be taught in training sessions. Thirdly, and finally, the “product-governed quality assurance” model is used.

Below, we will first outline the basic concept behind this model. We take the institutional repositories of the DFG (IRD) as an example, the objectives of which are described in chapter 3. Afterwards, we will introduce a number of products based on the IRD and the associated quality assurance processes in chapter 4. Chapter 5 concludes by summarising the findings and outlining the prospects for future plans.

2 The concept of “product-governed quality assurance” model

The quality of a data record increases with the frequency with which it is used. This basic principle, though trivial in itself, is a key characteristic of the “product-governed quality assurance” model. Each product addresses a specific group of users with specific interests. Each of these groups is able to “react” to any given product. It is beneficial to quality assurance if errors or omissions in the data used in the product are reported. If the information provider receives such feedback, the quality assurance process is initiated.

Most of the information products available from the DFG are based on a single source of data. In this case, it is the ElektrA system, which is used to process the research funding proposals at the DFG’s Head Office. If errors are identified in database-driven products, they are sent to a central unit at Head Office that is solely responsible for data-related quality assurance issues. There, the reported error is first checked, then classified, before finally a way of resolving the problem is sought. This process will be described in chapter 4.6.

Some errors are systematic and they are the result of poor user navigation in the ElektrA system used to collect the data submitted with the proposals. In such cases, the reported error results in the software being modified. Other errors can be put down to poor training of the staff who compiled the data. This is then dealt with by making changes to the staff training provided. Furthermore, there are errors that are merely due to carelessness, which can be corrected on a case-by-case basis. One special category of errors are those relating to specific structural data that is subject to continual change, in other words, errors which are primarily the result of data that is out of date. Managing and correcting this kind of error is particularly difficult, and will be dealt with in detail below.

It should be pointed out that one of the primary conditions for the product-governed quality assurance approach is that this method is based on a single data source being used as the basis for a number of information products. In the DFG’s case, this database is filled primarily with data generated by a standardised process during proposal processing. The use of the data for research information and statistics is merely secondary. It is primarily used to create individual products such as letters to applicants and to reviewers, or documents for the DFG’s decision-making bodies. Due to the supplementary use of the database to record reports of errors from a variety of sources, the data is permanently “in a state of flux”. The process and product-controlled monitoring of the data quality contributes to the constant improvement of both old and new data. Having a single source of data, product-oriented

data collection and constant adjustment performed by a central quality assurance management system are thus the main pillars of the product-governed quality assurance approach.

3 The Institutional Repository of the DFG (IRD)

In Germany, a lot of parties and institutions are involved in the organisation and funding of research at universities and non-university institutions, for example the DFG, the Alexander-von-Humboldt-Foundation (AvH), the German Academic Exchange Service (DAAD), the German Rectors' conference (HRK), the Max Planck Society (MPG) and the Fraunhofer Society (FhG). Since the late 1990's, there has been a growing need to exchange data on an institutional basis between these organisations, for example in the context of national rankings (see chapter 4.3). For a number of reasons, the DFG itself was in need of a standardised institutional classification of proposals and reviews as a source of information for a database-driven system for the administration of its clients' addresses (applicants, reviewers etc.) used for sending letters as well as a basis for statistical products and online information systems. The possibility of a common key for institutional affiliations was therefore discussed as a helpful tool.

For this purpose, the Institutional Repository of the DFG (IRD) was developed, and finally launched in 2005, together with the DFG's internal proposal processing system Elektra, already mentioned above. The IRD covers more than 20,000 institutes at German universities and non-university institutions. About 80 universities are covered, including all of their departments. Additionally, the IRD also records information on the main institutes of all other universities as well as the institutes that belong to the major German research organisations (including the MPG, the Helmholtz Association, the Leibniz Association, or the FhG). Each data record indicates not only several types of addresses, but also the subject specialisation of the institution as well as classifying it in terms of how it fits into the organisational structure of the institution itself (for example, as a faculty or a laboratory within an institute etc.) (for more details see Figure 1).

This final aspect allows the IRD to be used as a tool to provide a structure for information products or for performing statistical analysis at varying levels of detail. A number of examples are described in chapter 4.

The collection of information on the organisational structure of German universities is subject to constant change, with new institutes opening, and existing institutes closing, being renamed or merging with other institutes. These changes need to be reflected in the database as soon as possible in order for the data to be used productively.

Using the product-governed quality assurance method, it is now possible to guarantee that changes to the organisational structure of universities are communicated to the DFG through as many channels as possible. The following chapter describes this on the basis of five examples.

Name	Institut für Stromrichtertechnik & Elektrische Antriebe
Name engl.	Institute for Power Electronics & Electrical Drives
Short-Name	ISEA
Subject_ID	7100
Subject_Name	Elektrotechnik
INST_ID	68345
Part of	Fakultät für Elektro- & Informationstechnik
Federal State	Nordrhein-Westfalen
Country	DEU
Inst.-Form	University
Inst.-Type	Institut
Postal Information	Institut für Stromrichtertechnik & Elektrische Antriebe RWTH Aachen
Street	Jägerstr. 17/19
Zip Code City	52066 Aachen
Phone	0241/80-6920
Fax	0241/67505
E-Mail	dedoncker@rwth-aachen.de
Internet	http://www.isea.rwth-aachen.de
Parent_ref	72545

Entity

- Name of Institution
- Address Information
- Internet-address
- E-Mail-address
- Subject Classification
- Type of Institution
- Hierarchical Info

Figure 1: Depth of indexing of institutes within the Institutional Repository of the DFG

4 IRD-based Products

The question is: which services contribute to “product-governed quality assurance”? The following selection gives a few examples – while limiting itself to those products and services that make a particular contribution to quality assurance of the IRD. Initially, only the characteristic profile of each of these services is described, followed by a brief outline of how each of them contributes to quality assurance.

Apart from the first example, which the DFG’s IT department is responsible for, these services are developed by the DFG’s Information Management section, which provides different kinds of information services on research projects and programmes funded by the DFG (including statistics, evaluations, web-based information systems and general internet and intranet services).

4.1 Individual letters and consultation documents

The most important service based on IRD are the letters which are generated during the course of proposal processing, in particular to applicants, reviewers and members of the DFG’s statutory bodies. In the past, the addresses used for these letters were recorded manually as free text. Since ElektrA was introduced, however, the addresses have all been collected and embedded using the IRD integrated in the system. Employees at the DFG’s Head Office use an interface to select institutes, which makes it easy to quickly locate the correct address by using a keyword search with various key fields such as town, kind of institution, type of department, etc. After finding the correct institute, the employees are able to attribute the address to the applicant. If an institute cannot be found in the database, the user can create it provisionally. This ensures that once a work-flow has started, it is not necessary to interrupt it again.

The product-governed quality assurance method is derived from the fact that the data generated using the IRD is used actively, for example to address letters. Roughly 70 - 80 percent of all of the addresses in the IRD are used to contact applicants, reviewers or other groups of people at least once a year. This ensures that the address data is kept very up to date. Any letters sent to an incorrect address are returned to the sender. This also contributes to quality assurance.

4.2 Institutional Management Reports

Another product used to support the quality assurance process is a database-driven report that is sent to the DFG's member institutions every six months. This report lists all funding approvals granted by the DFG in a specific period, sorted by department and institute, including details about the applicant who submitted the funding proposal, the project title, and the amount of funding approved. The report is used by the universities as an important source of information for internal controlling.

The structure of the reports is derived from the structure of the university in the IRD. Thereby, missing institutes or wrongly classified institutes are easily detected. The central contact person at the university can then give immediate feedback to the DFG about any structural changes.

4.3 The DFG Funding Ranking

The Funding Ranking published by the DFG (see www.dfg.de/en/ranking) is one of the DFG's most important statistical information products. Following previous publications in 1997, 2000 and 2003, the fourth Funding Ranking presents an overview of the distribution of awards to universities and non-university research institutions. The scope of the report has increased considerably compared to previous editions. Alongside the report's central indicator – DFG awards per research institution – the publication also covers a wide range of additional indicators regarding publicly financed research. In addition to DFG-related data, the report also provides information on R&D funding for selected federal programmes, for thematic priorities within the European Union's Sixth Framework Programme, and on collaborative industrial research projects funded by the German Federation of Industrial Cooperative Research Associations „Otto von Guericke“. It also takes the number of visiting fellows funded by the German Academic Exchange Service (DAAD) and the Alexander von Humboldt Foundation (indicators of international appeal and visibility) into account, and the number of DFG reviewers and review board members (as an indicator of academic excellence).

The DFG Funding Ranking is broadening its scope and it is basing its findings on an ever-increasing basis of data on the subject-related and topical emphases of universities. Thus, the Funding Ranking is also looking at the issue of regional cooperation with other universities and non-university research institutions. Through this, the Funding Ranking makes a significant contribution to the discussion on the how the universities build their profiles.

The Funding Ranking contributes to quality assurance in a number of ways:

- One of the major steps in producing the report is the compilation of data from various sources of information (primarily funding organisations). As we are looking at institu-

tion-related information, we need to generate concordances to cross reference between the various institutional systems used by the different information providers. Creating these concordances contributes to quality assurance in cases where institutions may be listed using different details for names, places or affiliations to other organisations (for example, the Max Planck Society). Checking these discrepancies results in a positive effect for quality assurance, both in terms of the data held by the DFG and for any other bodies involved in the Funding Ranking.

- The second way in which it contributes to quality assurance is due to the fact that the figures included in the Funding Ranking are of great value to the universities it covers for planning and control purposes. To the universities, high quality data is imperative, which means that it is checked meticulously by the DFG – for instance in terms of whether certain institutes located in one place (for example, hospitals) belong to the university, from an organisational point of view, or are actually independent. The issue of organisational affiliation to bodies such as the Max Planck Society or the Helmholtz Association is also checked very thoroughly.

4.4 GEPRIS

The DFG's current research system "GEPRIS – German Project Information System" (see www.dfg.de/gepris) is one of the most established public information services provided by the DFG, based on data produced while processing proposals (see also Guedler 2006). GEPRIS, which has been available online since 1999, provides information on more than 60,000 projects and programmes funded by the DFG, nearly 40,000 individuals and more than 15,000 institutes at German universities and non-university research institutions (see Figure 2).

Figure 2 Screenshot of GEPRIS

The system underwent a major re-launch in mid-2006. One of the main new features is the integration of the IRD. This allows users to not only search for keywords (in project abstracts), individuals or subjects, but also to search by region (federal state or town) and according to various institutional criteria. In addition to the improved search functionality, the link to the institute database also offers the opportunity to view the projects funded by the DFG at any institution, sorted according to that institute's own system and hierarchy. Within just a few clicks, GEPRIS allows the user to view all of the projects at a university, or even within a faculty or a department at a glance.

All information published in GEPRIS is checked twice. First during the course of proposal processing, and a second time when applicants are informed that their projects will be published in GEPRIS. A letter with all the published information is sent to the applicant who then has the chance to give a feedback about any changes. The experience shows that applicants use the system on a regular basis and give detailed feedback about missing information or projects.

4.5 Research Explorer

The Research Explorer (REx; see: www.research-explorer.dfg.de) is a comparatively new bilingual information product by the DFG and the German Academic Exchange Service (DAAD). As a portal primarily for international users, it provides a central point of access to the "research centres" throughout Germany. The aim is to offer foreign scientists, who are interested in conducting research in Germany (for example, because they are looking for project partners or places where they can work as visiting scientists), a structured source of information on German research institutions. The database does not give detailed information on the research topics of the institutes, but restricts itself to providing links to the webpages of the institutes listed to allow further exploration (see Guedler 2006: 84) (see Figure 3).

The Research Explorer gives information on more than 20,000 institutes at German universities and other research institutions. In addition to the address, the Research Explorer also contains information on the subject focus of an institute and its position in the university's organisational structure (laboratory within an institute, institute within a faculty, faculty within a university, etc.).

The search options in REx have been enhanced to include the option to search for all institutes active in a certain discipline (computer science, for example). It is possible to search for institutes by performing either a keyword search within the name of the institute or using a disciplinary thesaurus listing more than 300 different subjects.

From a quality assurance point of view, an important feature of REx is a specific on-line form, which allows any user to report errors to the DFG in a structured manner.

Deutsche Forschungsgemeinschaft **DFG** Research Explorer Das deutsche Forschungsverzeichnis

Homepage
Research Explorer
Map of Germany
Search Assistant
Advanced Search
Tips and Advice
Imprint and Contact

Deutsch

Map of Germany
Search Assistant
Advanced Search
Tips and Advice
Imprint and Contact

organisational structure upwards from this facility

University of Cologne:
Faculty of Education

selected institution

Institute of Psychology

Address
University of Cologne
Institute of Psychology
Gronewaldstraße 2
D-50931 Cologne

Website
www.uni-koeln.de/ew-fak/psychologie/

Assigned to Subject Area
Psychology in general

Type of Facility
Universities

search results new search

If you are a member or representative of this institution and would like changes made to the information above, please use our [data correction form](#) (available only in German).

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Contact | Imprint

DAAD Deutscher Akademischer Austausch Dienst
German Academic Exchange Service

DFG

Figure 3 Screenshot of the Research Explorer

4.6 Quality assurance at the DFG

Although all of the products outlined above refer to the same data source (IRD), they are tailor-made to meet specific needs of each target group. Therefore, they also contain different information and call for different quality assurance procedures.

Whereas the Research Explorer (REx) provides a standardised form for users to report errors, all of the other products rely on detailed feedback by email.

Any applicant who discovers that their address is wrong or out of date in GEPRIS, can report this by sending an e-mail to a central address given in GEPRIS. University representatives who receive the management report (see chapter 4.2) by the DFG can send requests for corrections by e-mail to the department which sends out the report. The greatest quality assurance effect is due to the personal letters referred to in chapter 4.1, which either result in individual requests for corrections or – if they are returned because they cannot be delivered – initiate an active search for the correct address details in the relevant department at the DFG. If addresses have been added provisionally during the proposal processing, the sys-

tem creates automatic reports. These are sent to a central data quality assurance unit, which verifies the provisional addresses within a short time span.

Regardless of how the information on necessary corrections of the IRD reaches the DFG, all changes are processed within a central quality assurance unit. This team is located within the department information management, and it is the only team authorised to change the IRD. The changes are only done after thoroughly checking the suggestions and after comparing them to other reliable sources. Within this stage of the process, any accidental doublets are deleted. The full details of any new institutes are collected and their master data is integrated into the appropriate hierarchy of the parent institution.

This change management process is based on a standardised set of rules for the administration of institutional data. These rules determine how the details of each institution (names, addresses, other information) are recorded and updated, and they also specify the workflows for editing the data. Those workflows describe and support the whole data management process, from receiving an email with a change proposal, to editing different data fields and finally to sending a standardised feedback to the proposer of the changes.

5 Conclusion and prospects

Whereas activities to date have been restricted purely to products produced by the DFG, in future we plan to make this high-quality database, the development of which is described above, accessible to partners who wish to use it for their own products, such as cooperative ventures with institutions that use the DFG's data to perform evaluations, for instance to analyse publications and citations with respect to a specific institution or institutions.

The "product-governed quality assurance" model thus serves not only to increase the level of acceptance of the research information system which uses this data, but also improves the basis for performance-based evaluation systems.

An increase in the number of external partners is also planned for the Research Explorer (REX). Cooperation with other research & funding organisations will lead to more and more information on the research (and teaching) profiles of the institutes covered being integrated in REX.

Although each additional partner who is added to the information system increases the amount of work required to coordinate the various datasets, this coordination, as was the case for the Funding Ranking project described above, also represents an investment in the overall quality of the underlying data – which ultimately benefits all of the other information products, whether already in existence or yet to be created.

To sum up, these very diverse products, each with their own very different quality assurance procedures, all make an overall contribution to quality assurance that a pure information system that is used solely for information purposes, would never be able to.

Quality is the product is the quality – according to this principle, all of the products ultimately benefit from the various quality assurance procedures.

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