

An information system perspective on research information systems

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1. Summary

The growing demand of reporting obligations with which universities are being confronted has substantial influence on the perceived relevance of research information systems (CRIS). Although being summarized under the same term, implementations of such systems show a wide range regarding the design and the purpose of use. The fact that there is no shared as well as comprehensive definition for research information systems causes the vague usage of this term. By considering a well-accepted definition of information systems in general, this paper deals with the derivation of applicable characteristics for a CRIS to foster the establishment of a common understanding for this type of information systems.

2. Motivation

What are the main research topics at the university? Which projects are being conducted at the moment? To which extent are results produced within interdisciplinary research groups? Which activities are designated to support the development of young researchers? Due to the growing reporting obligations regarding their research activities, universities see themselves in regular terms confronted with such requests. To reduce the effort as well as to ensure the required information quality, an integrated information management including sufficient tool support is needed. The implementation of research information systems can be seen as proven approach to overcome these requirements (Ribeiro et al. 2016; Sticht 2014). The endeavors of such a project are made difficult due to the lack of a consistent definitional term of a CRIS. Instead in current literature definitional contributions refer heavily to exemplary cases. In this surroundings a CRIS is generally described as database or information system which deals with the collection, management and provision of research information (DINI AG FIS 2015; Jeffery and Asserson 2006; Hornbostel 2006). Thus two main objectives can be derived: (i) harmonization and consolidation of decentralized pools of research information in a central research information system as basis for (ii) providing those information in various application scenarios (Herwig et al. 2012). Having a wide spectrum of potential application scenarios as well as several ways of implementing a CRIS in the institutional environment, the aim of this contribution is to derive the most common design elements which could contribute to tighten the terminological understanding of what a CRIS is as well as serve as orientation in the process of fitting the research information system into the underlying environment.

3. Research Design

For the extraction of design elements, existing attempts to define a CRIS, qualitative research studies (Ribeiro et al. 2016; Sticht 2014) as well as current implementations are evaluated under consideration of a well accepted information systems framework. According to (Teubner 1999) information systems (IS) are social-technical systems which evolve through the three main factors the involved humans, the intended task and the used information technology. The actual shape of an information system is formed by reciprocal interdependencies of these components. For Instance, the intended task determines to a great extent the requirements for an appropriate usage of information

technology. At the same time the definition of the task is significantly influenced by the included users as well as their organizational surroundings. Finally the information technology influences the shape of an information system insofar that the task completion can potentially get enhanced through IT on the one hand and on the other hand it brings restrictions for the concrete IS-implementation. Applying this framework to the context of research information systems a comprehensive specification and systematization can be developed. As a result a morphological box is developed which facilitates an extensive overview of the essential design elements including the broad spectrum of variants within those. This broad spectrum of variants within each dimension illustrates various application scenarios of a CRIS and the resulting implementation forms.

4. Results & Conclusion

Human and Organizational perspective

The human and organizational perspective defines the **environment** in which the CRIS will be integrated. Mainly such systems serve as university-wide integration platform for research information (Herwig et al. 2012). Systems with this purpose can be classified as CRIS for individual institutions. Another application scenario is the implementation as institutional CRIS in which researchers and their activities are being aggregated on the basis of several institutions. Possible dimensions for aggregation are regions or specific domains - e.g. one CRIS that merges all activities for one country or federal state (Johansson et al. 2012). Furthermore so called research portals are being established which consist information about research of specific discipline oriented communities (Becker et al. 2010). The involved **actors** of a CRIS depend at first heavily upon the underlying environment. Moreover the overall scope of tasks for which it should be used influences the group of actors to a great extent. Thus, a broad spectrum of possible actors is conceivable which ranges from the research themselves, the university administration to funders or the public media.

Task Perspective

In general, the **scope of application** of a CRIS can be summarized as IT-based support and execution for tasks in the field of research management. This can be further divided into the three main areas: (i) the dissemination of research information via various communication channels, (ii) the fulfillment of reporting obligations as well as (iii) the process integration for administrative tasks (Locker-Grütjen et al. 2012). For all main purposes the existence of reliable data is essential. As the data is located in various source systems or even in unstructured form, several **types of data collection** have to be taken into consideration. Similar to the type of data collection the **organizational responsibility and implementation of the data import** relies heavily on the circumstances and restrictions present within the institution. For instance, in an institutional CRIS the responsibility for data collection and import is most certainly allocated to researchers, the university administration and library staff (Sticht 2014). Finally the **contents of the CRIS** in terms of the data which will be processed and provided for the previously described use cases is highly task-dependent. The information needs the institution has to fulfill can be seen in this phase as suitable first reference object. Applied to the German research environment the so called *Kerndatensatz Forschung* is a national specification which is supposed to foster the establishment of common standard (Wissenschaftsrat 2016). Furthermore on the European level with CERIF a reference data model exists which is under continuous development (Jörg et al. 2012).

IT Perspective

In contrast to the most common understanding of a CRIS as a single software platform which covers all functionalities in this environment, several different **IT-architecture concepts** are conceivable. Besides this monolithic approach, the research management can be implemented in two or more software systems in a modular manner. This setting is particularly suitable if the institution already has well-developed information systems within the university administration and the library. Here the CRIS is a conglomerate of different application systems connect through an integration platform. Another aspect of the IT-perspective which is closely linked with the general architecture is the method of **data storage**.

Dimension		Value										
Environment	Institutional										Community-related	
Kind of Organisation	Single Institution										Group of Institutions	
Actors	Researcher	Management	Committees	Academic planning			Library					
	International Office	Public Relations		Funder	Companies	Media & Press						
	Persons	Organizations	Publications	Projects	Awards	Patents	Research instrumentation					
Contents	Doctoral Studies	Habitations		Cooperations	Memberships	Classifications						
Scope of Application	Research dissemination										Research Reporting	Process integration
Dissemination of Research Information	Research Portal										Dynamic Provisioning for Personal Webpages	
Reporting	Dashboards										Ad-hoc Analyses	Advanced Analyses
Process Integration	No Process Integration										Organizational Process Integration	Technical Process Integration
Type of Data Collection	Manual Data Collection										Automated Import from Source System	User-triggered Import from Source System
Responsibilities of Data Collection	Centralised Acquisition	Decentralised Acquisition		Decentralised Acquisition with centralised Validation			Centralised Acquisition decentralised enrichment					
Regular Cycle of Data Collection	Continuous										On Occasion	
Type of Data Storage	Isolated Data Storage										Central Data Storage	Dynamic Linking
IT-Architecture Concepts	Monolithic Architecture										Modular Architecture	

Figure 1: Design Elements of Research Information Systems

Based on existing qualitative studies, existing definitions and practical knowledge gathered during the operation of a CRIS, the main characteristics of such systems were derived (cf. figure 1). The resulting morphological box provides a comprehensive systematization which can be used for further stages of development like the derivation of detailed system categories.

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6. Authors' Biographies

Sebastian Herwig holds a Ph.D in information systems from the University of Münster. Since 2011 he is head of the division for research information management at the University of Münster.

Stefan Schlattmann is research assistant in the division for research information management at the University of Münster. He studied information systems at the University of Applied Sciences in Hanover as well as at the Leuphana University Lüneburg.

7. Hint

This paper is based on findings which priorly published in German:

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