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Research article

Understanding the dominance and advocacy of the design-oriented research approach in the business informatics community: a history-based examination

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Abstract
The objective of this article is to explain the dominance and advocacy of the design-oriented research approach in *Wirtschaftsinformatik* (Business Informatics or BI), one of the major Information Systems (IS) communities. To this end, we employed a research approach based on autobiographical material. Sixteen well-known BI scholars served as informants, and provided career autobiographies in which they document their perceptions and observations regarding the genesis and development of BI. The average age of this sample of contemporary witnesses is 70 years, signifying a rich body of experience. Based on an interpretive analysis of the data, we find that the design of IS is deeply rooted in BI's history, and our results also show that there have always been close relationships with practice. As a consequence, we conclude that the success of BI as an academic community is inseparably associated with systems design, implementation, and engineering. Against this background, we argue that it is unlikely that BI will weaken its design orientation in the future, although external forces signify a shift to a more behaviouristic research approach. In order to balance the internal strength of the community and the external forces, we suggest a 'theory-driven design approach' as a viable strategy for the future orientation of the community.
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Introduction

Information Systems (IS) is a scientific discipline with global reach that investigates the development, use, and impact of information and communication technologies (IT). In this article, we focus on historical investigation of one major scientific community within the larger IS discipline, namely that of *Wirtschaftsinformatik* (Business Informatics or BI). Business Informatics, which had its genesis in the 1960s, is now the dominant IS community in the German-speaking countries (Austria, Germany, Switzerland). This community is best characterized by its strong connections to industry and its concentration on engineering (e.g., Heinrich, 2005; Frank *et al*., 2008; Buhl *et al*., 2012). Thus, even though most BI scholars acknowledge that both research *and* development are equally important objectives of scientific enquiry, the focus of BI has been on the development of IT artefacts, and not on the theoretical investigation of IS behaviour.

In the beginning, the genesis of BI and its early development were significantly influenced by the implementation and rapid expansion of IS in industrial organizations, as well as by the resulting demand for qualified IT personnel. Later, as a consequence of these early developments, increasingly

more academic BI institutes and departments were founded, contributing to the successful institutionalization of the community (Heinrich, 2002; Heinrich *et al*., 2011). Today, BI is an established field of study. Yet, discussions on the identity of the community have become more intensive, mainly as a consequence of the increasing influence of other IS communities, particularly that of North American IS research, which has its focus on behavioural research, and hence is substantially different from BI (e.g., Frank *et al*., 2008; Heinrich *et al*., 2011; Buhl *et al*., 2012). Today, even though BI seems to be well prepared for the future challenges in the scientific landscape, the fundamental question of BI's future strategic focus needs to be discussed. This article seeks to contribute to this discussion, based on the investigation of the community's history.

Specifically, this article is based on an ongoing research project that investigates the history of BI. This project has been initiated and conducted by Lutz J. Heinrich, a well-known BI scholar who has helped to shape the field from its beginning (Frank *et al*., 2008: 396), with the collaboration of historian Rudolf G. Ardelt at Johannes Kepler University Linz, Austria. A project documentation summarizing the project's motivation, methodology, data, and findings from the beginning of the project in February 2009 until March 2011 was published in a German-speaking monograph (Heinrich, 2011). The objective of this project is to study the genesis and development of BI – in short, to create a documentation of BI history that represents the first systematic investigation on this topic.

Despite the omission of a systematic enquiry into the history of BI in the research literature that is as comprehensive as the present project, a number of papers have addressed different aspects of BI's history (e.g., Resch and Schlögl, 2004; Heinrich, 2005; Heilmann and Heinrich, 2006; Wilde and Hess, 2007; Frank *et al*., 2008; Steininger *et al*., 2009; Buhl *et al*., 2012). For example, a study by Heilmann and Heinrich (2006) illuminates the topics conventionally addressed in BI research, while the investigation by Wilde and Hess (2007) sheds light on the research methods used.

What is likely the most extensive investigation into important facets of BI's history was conducted by Frank and colleagues (Frank *et al*., 2008), who interviewed eight scholars from the North American IS community and six scholars from the German-speaking BI community in order to identify differences in the communities' paths of development. Also, a recent paper by Buhl *et al*. (2012), which is organized along the history of BI's main publication outlet, the journal *WIRTSCHAFTSINFORMATIK*, outlines developments of BI history. However, though these works have made valuable contributions to the literature, the authors did not have an explicit intent to systematically reconstruct the community's history in its entirety, nor was that the result.[1]

This article, however, reports on an investigation that does have this explicit goal. In contrast to the ongoing research project, which is focused on BI's history in its entirety, this study targets historical events and developments that contribute to a better understanding of one specific yet highly important facet of contemporary IS research, namely the debate on the superiority of one of two research approaches – behaviouristic research and design-oriented research. While the former approach is focused on the development and testing of theories on IS behaviour of individuals, groups, and organizations, the latter concentrates on the development of artefacts (e.g., software prototypes or process models).

Recently, 10 well-known scholars from the BI field have published a 'memorandum on design-oriented information systems research', a document intended to 'propose principles' of this approach (Österle *et al*., 2011: 7). The response by a group of prominent editors-in-chief of mainstream IS journals (*EJIS*, *JAIS*, *ISR*, *MISQ*), which 'disputes and expands several premises used to justify the main argument in the memorandum' (Baskerville *et al*., 2011: 11), may serve as an example reflecting important positions in this debate.

In essence, Baskerville *et al*. 'welcome the intention behind the memorandum to emphasize relevancy in IS research and the quest to focus on the innovative and transformative role of information technology (IT) artifacts' (p. 11), but also stress that the characterization of Anglo-Saxon IS research as being based on a behaviouristic approach 'badly oversimplifies and stereotypes Anglo-American IS research' (p. 12). Importantly, because Österle *et al*. write that 'European IS research is in danger of shifting from a design-oriented discipline into a descriptive one', and further describe this shift as a 'quite questionable trend' (p. 8), there is reason to assume that the authors of the memorandum and, likely, a large number of the 111 supporters (all full professors) prefer the design-oriented research approach over the behaviouristic one, despite the fact that the memorandum states that 'while the memorandum's initiators and signers advocate the idea of design-oriented IS research, they also explicitly welcome behavioural research' (p. 8).[2]

Against the background of this debate, on which a number of relevant arguments have already been exchanged (i) in publications in related disciplines such as computer science (e.g., Newell and Simon, 1976; Wulf, 1995; Denning, 2005) and organization science (e.g., Simon, 1996); (ii) in discussions on rigour *vs* relevance in IS research (e.g., Benbasat and Zmud, 1999; Davenport and Markus, 1999; Lee, 1999); and (iii) in essays on the identity of the IS discipline (e.g., Benbasat and Zmud, 2003; Argarwal and Lucas, 2005; Lyytinen and King, 2006; Weber, 2006), this article seeks to contribute to a better understanding of the following research question:

> What major historical events and developments have contributed to the dominance and advocacy of the design-oriented research approach in BI?

The main theoretical contribution is our intent to explain the dependent variable 'dominance and advocacy of the design-oriented research approach in BI' based on 'historical events and developments', the independent variables. Moreover, the research presented in this article is methodologically distinct from the existing literature. We applied an approach similar to *written autobiography*, of a kind pursued, for example, by the Mass Observation Archive, University of Sussex (for details, see www.massobs.org.uk). In an autobiography, typically, a person provides information about his or her own life, and in doing so often reveals details of specific aspects of the profession or field of study. In the application as used by the Mass Observation Archive, and as is similarly applied in this study,

those data from the autobiographies are used to construct an anthropology of a society or community that looks not only to the past, but also to the future. This approach is established in history (e.g., Lejeune, 1989; Barros, 1998), and has been applied in such areas as research on the history of computing (e.g., Hall, 2000) and on the history of management (e.g., Chandler, 2009).

To address the research question at hand, in order to use autobiographies as data sources, an interpretive approach (e.g., Carr, 1961; Walsham, 1995, 2006) is applied in order to analyse the content of the autobiographies (Krippendorff, 2004). Because this approach is novel in BI, and different from the methods on which the existing studies are based (e.g., the interview in the case of Frank *et al*., 2008; the analysis of published journal articles in the case of Heinrich, 2005), this research was designed to reveal new insights into the history of BI, thereby not only helping to create an understanding of the dominance and advocacy of the design-oriented research approach, but also providing insights into the successful future development of BI, because '[s]eeing the past can help one envision the future' (Neustadt and May, 1986: xv).

In line with this statement, Land (2010) argues that '[h]istory provides a richness in understanding which its neglect denies the IS researcher a vision of the whole story. And it is only with this understanding that we can learn lessons from past and current events' (p. 390). Similarly, Mason *et al*. (1997a: 307) write in their pioneering article on the significance of the historical method for IS research that '[h]istory helps one understand the sources of contemporary problems, how they arose and how their characteristics unfolded through time. It also identifies the solutions that worked in the past and those that did not'. Thus, studying the history of a scientific community, here BI, may serve the purpose of *critical self-reflection*, which makes possible a more informed preparation for future challenges (Ardelt, 2011).

Josef Schumpeter (1883–1950), the great Austrian-American economist, even argues that for a field of enquiry to earn the designation of 'scientific discipline', it is necessary to provide information about its history, because otherwise it is not possible to understand the field's paradigms, theories, data, and ethics (Mason *et al*., 1997b). Consequently, any field of enquiry that does not investigate its own history is not only incomplete but, based on Schumpeter's notion, it is underdeveloped and premature, without any right to consider itself as a scientific discipline.

The remainder of this article is structured as follows: In the next section, we briefly outline background information on history research in BI, as well as the major characteristics of the research project. A discussion of our methodology follows, and this part also includes a description of the characteristics of the sample. Afterward, we present the results. The descriptive results (i.e., the major topics addressed in the personal narratives) are structured along 12 categories. The explanatory results (i.e., those that help to explain the dominance and advocacy of the design-oriented research approach in BI) are structured along a chronology of historical events and developments, and they are summarized in a sequence of phases. This is followed by a reflection on the results, which may, particularly for BI scholars, help in future decisions and actions to cope with upcoming challenges, thereby sustaining a competitive position in the scientific landscape. Finally, we provide concluding comments.

Background and research project characteristics

Introductory BI textbooks (e.g., Stahlknecht and Hasenkamp, 2010), as well as encyclopaedias, both in print (e.g., Back, 2001) and online (e.g., www.enzyklopaedie-der-wirtschaftsinformatik.de), sometimes give an account of chronologically sorted events with relevance for BI. However, because these accounts typically comprise only a small number of exemplary events (see also Frank *et al*., 2008: 393), even their descriptive value is limited. More complete lists of events relevant for the genesis and development of BI are based on data collected and published by Heinrich (1988, 1992, 1996, 1999, 2002). One comprehensive chronology drawing upon these data, for example, has been published recently in a textbook (Heinrich *et al*., 2011: 36–45).

Despite the fact that valuable work has been carried out in documenting events relevant for the history of BI, the nature of these studies is purely descriptive, and therefore their explanatory power is limited. History research, however, should not end up merely with lists of historical events, because history is 'more than a mere chronology and body of facts' and '[t]he assemblage of admissible and ordered facts must … be interpreted and its meaning comprehended' (Mason *et al*., 1997a: 315). Consequently, the study of history is a study of causes. The historian Carr (1961) writes: 'The historian … continuously asks the question: Why?; and, so long as he hopes for an answer, he cannot rest' (p. 113).

Considering that (i) most of the research on the history of BI is descriptive rather than explanatory, and (ii) an established student's guide on the study of BI has eliminated a chapter on history in its most recent edition (Kurbel *et al*., 2009), there is reason to assume that a considerable number of BI scholars have a poorly developed sense of history. Among the reasons for this situation are, first, that meta-research (i.e., research about research) does not play a significant role in BI, despite the few notable exceptions (e.g., König *et al*., 1995; Resch and Schlögl, 2004; Heinrich, 2005; Frank *et al*., 2008), and second, that the potential benefits of history research for the scientific community, such as the formation of a strong identity (Hirschheim and Klein, 2003; Klein and Hirschheim, 2008) and the ability to better cope with future challenges (Mason *et al*., 1997a), are widely unknown.[3]

As a foundation for the discussion of our methodology in the section to follow, we briefly summarize here the major characteristics of this research project:

- The database consists of primary sources in the form of written autobiographies authored by 16 BI scholars.
- The perceptions and observations reported in the autobiographies are systemized and analysed along a set of 12 categories.
- Events significant for the history of BI are integrated into the most recent version of the chronology of BI history, namely that of Heinrich (2011).
- The entire history is described in the form of a sequence of phases.
- This sequence of phases enables the identification of possible causes for the dominance and advocacy of the

design-oriented research approach in BI, because causality implies a difference in the temporal order of variables.

Methodology

Approach and procedure

Autobiography makes possible the collection and investigation of data about significant events in the past (e.g., Lejeune, 1989; Barros, 1998). Among the groups of people who contribute to the development of historical knowledge, contemporary witnesses (i.e., individuals who have made observations with respect to relevant events) are among the most valuable informants. Obviously, this method can only be applied in investigations on topics that are not too far in the past, but the history of BI is such a topic. The task is often that of the researcher to prompt written statements by informants, allowing the researchers to then generate documents that serve as a database for subsequent analyses. Specifically, the content of autobiographies can be analyzed by the investigator(s) to find an answer to the research question at hand. The approach of generating data on the basis of statements by contemporary witnesses has been appreciated in the IS literature. Mason *et al.* (1997a: 313), for example, write: '[M]any of the pioneers … are still alive. They are sources of eye witness rather than hearsay evidence'. Access to such information may positively affect data reliability, because knowledge derived from the direct experience of these informants can provide a level of detail not otherwise available – particularly when gathered with respect to a specific object of study, as is done here for the history of BI.

In the context of this research project, a career autobiography is defined as a document in which an individual describes his or her perceptions of, and observations about, (i) historical events, (ii) artefacts such as institutions, curricula, and research projects, and (iii) persons with whom there had been personal involvement. Importantly, the description is developed and recorded at a later date. Thus, it is not simply a diary or journal written at the time of the experiences; rather, it is a documentation of current thoughts and reflections about past perceptions and observations (Krusenstjern, 1994).[4] To the best of our knowledge, at the beginning of this research project no such autobiographies were available. Consequently, we had to initiate the generation of such documents.

A decision had to be made about the group of people to be invited as informants. Instead of selectively picking potential informants, we invited all 18 persons on the editorial board of the journal *WIRTSCHAFTSINFORMATIK* at the time of its inaugural publication in 1990, all of whom were full professors in BI at a German, Austrian, or Swiss university.[5]

In March 2009, we invited the 18 scholars to contribute to the investigation of the history of BI. Specifically, we asked them to write autobiographies. The letter of invitation contained a brief description of what an autobiography is. Each informant received detailed information on the investigators' expectations regarding the autobiographies, particularly that their documents should conform to the following major criteria. First, each informant was to write the autobiography independently (i.e., co-authorships were discouraged). Second, informants were not to make enquiries in order to write the autobiographies. Rather, they were instructed to write the autobiographies 'from memory'. Third, informants were instructed to avoid the citation of related work, because it was the goal to reconstruct what knowledge informants carry in their minds, rather than what they are able to reconstruct based on additional enquiries into the literature. Although we did not provide guidelines for the formal creation of the documents, we suggested considering the style rules for essay writing (e.g., perform a Google search for 'essay writing'). We expected deliberate, yet smoothly formulated texts to result from these instructions.[6] As of 30 June 2010, we had obtained 16 autobiographies (in German), for a total of 150 pages (for details, see Table 2). Thus, the sample size of the present investigation is $N = 16$.

Because it was possible to rule out a belief that the genesis of BI took place before 1950, particularly due to the aftermath of the Nazi Era and World War II, we analysed the contents of 10 volumes of four German management journals, beginning with 1950 publications, and based on keywords that (i) are related to socio-technical systems and (ii) are typical for the scientific terminology during that time period; the term 'electronic data processing' may serve as an example.[7] Because we could not identify scientific BI articles in the four management journals, we dated the genesis of BI to 1961, when the first scientific monograph on the subject of BI was published (Hartmann, 1961).

Characteristics of the sample

The birth years of the 16 informants range from 1931 to 1951 (mean age: 70 years); 10 persons were born in the 1930s, five in the 1940s, and one in 1951. Eleven informants were emeritus professors in 2010.

With respect to the academic backgrounds of the informants (i.e., their fields of study, Ph.D., and postdoctoral lecturer qualifications), we found a significant dominance of business administration (nine persons studied this subject, 13 held a corresponding Ph.D., and six had obtained their postdoctoral lecturer qualification). Altogether, the 16 informants made 45 statements about their academic origins, of which 28 pertained to business administration (62%).

Moreover, we also analysed the location and focus of the universities at which the informants completed their degree studies, and their Ph.D. and postdoctoral lecturer qualifications. Altogether, 18 universities were mentioned, of which 16 are located in Germany as well as one in Austria and one in Switzerland. Thirteen of the 18 universities are institutions with a focus on social and economic sciences (mainly management), while the remaining five are technical universities.

Results

Descriptive results

The perceptions and observations reported in the autobiographies were systemized and analysed along a set of 12 categories. Four of these categories are well-known characteristics of scientific disciplines (Wohlgenannt, 1969; Khazanchi and Munkvold, 2000; Wilson, 2000), namely subject matter, objectives of scientific enquiry, research and development methods, and professional organization

Table 1 Descriptive results structured along twelve categories

	Explicitly discussed	*Mentioned*	*Not mentioned*	*Intensity of discussion*
Pioneers and founders	3	2	11	5
Development facilitators and barriers	10	0	6	10
Subject matter	6	4	6	10
Objectives of scientific enquiry	5	5	6	10
Research and development methods	6	3	7	9
Core areas in research and development	5	6	5	11
Curricula and programmes of study	6	4	6	10
Textbooks and journals	2	6	8	8
Conferences	5	4	7	9
Professional organizations	4	4	8	8
Science and practice	8	5	3	13
Reference disciplines	3	7	6	10

Note: Intensity of discussion is the sum of 'Explicitly discussed' and 'Mentioned.'

(e.g., association or society). We selected an additional eight categories, because they were mentioned in at least two of the 16 autobiographies – namely, pioneers and founders, development facilitators and barriers, core areas in research and development, curricula and programmes of study, textbooks and journals, conferences, science and practice, and reference disciplines. Table 1 shows descriptive results that are structured along the 12 categories; the order is oriented towards the genesis and development of the community.[8]

Each autobiography was analysed by the first author of this article, based on the terms listed in Table 1 (e.g., research and development methods), as well as corresponding keywords (e.g., case study, laboratory experiment, modelling, prototyping) to identify corresponding statements. To this end, the search function of a word processing program was used. Because four categories already existed *before* data analysis started, while eight categories were developed *during* analysis, we applied a mixed approach to derive the categories. This approach includes deductive elements (four categories were derived based on existing literature) and inductive elements (eight categories were derived based on the data) (Krippendorff, 2004).

Importantly, data analysis was not solely based on keyword searches. Rather, the keywords were used in order to quickly identify text passages that are likely to be related to the four categories that we had defined *ex ante*. Because eight out of 12 categories emerged during the study of the autobiographies, the primary technique of investigation was *qualitative content analysis*. Accordingly, the informants' narrative statements were used to draw conclusions about the history of BI.

We employed the following schema to determine the intensity with which each category is discussed in the autobiographies (see Table 1):

- The category is discussed explicitly, either based on the terms listed in Table 1 or on corresponding keywords (denoted as *Explicitly discussed*).
- The category is not discussed explicitly, but is touched on in the context of an explicitly discussed category (*Mentioned*).
- Neither the category nor a corresponding keyword is mentioned, nor is the category touched on in the context of an explicitly discussed category (*Not mentioned*).

In order to determine the intensity of discussion, we combined the frequencies of the categories 'Explicitly discussed' and 'Mentioned'. Based on this metric, we identify 'Science and practice' (Σ 13) and 'Core areas in research and development' (Σ 11) as the two categories which were discussed most extensively, followed by five categories with Σ 10 (e.g., 'Subject matter'). In contrast, the category 'Pioneers and founders' was discussed least extensively (Σ 5).

Table 2 exhibits descriptive results structured along the 16 autobiographies; three documents (numbers 5, 10, and 16) explicitly discuss six of the 12 categories. In contrast, Autobiography 2 explicitly discusses one category. In order to determine the intensity of discussion, we again computed the sum of the frequencies of the categories 'Explicitly discussed' and 'Mentioned'. Using this metric, we find that Autobiography 16 discusses 11 out of 12 categories (the highest value), while Autobiography 4 discusses four categories (the lowest value). Altogether, we observe a moderate degree of variance across the 16 documents with respect to intensity of discussion, $SD = 1.9$ (*M*: 7.1, score range: 0 to 12). Moreover, the table shows the number of pages of each autobiography. We observe a medium degree of variance, $SD = 3.6$ (*M:* 9.4/*MIN:* 4/*MAX:* 15).

In the following, we discuss the descriptive findings along the 12 categories. We include example evidence from the informants, in the form of narrative statements that we extracted from the autobiographies.[9] The full-text autobiographies are published in Heinrich (2011, see chapter B). All page numbers indicated with the excerpts refer to this source.[10]

Pioneers and founders

Three informants explicitly discussed the topic of pioneers and founders, and two further persons touched on this. Business administration professors played the most significant role, as indicated by the statement below. The next level of importance was that of scholars from applied mathematics, particularly from operations research, and from computer science:

> At the end of the 1960s, there existed no more than 40 to 50 business administration professors in the German-speaking region who were interested in electronic data processing, and typically these academics were 'lone

Table 2 Descriptive results structured along the sixteen autobiographies

	Number of pages	*Explicitly discussed*	*Mentioned*	*Not mentioned*	*Intensity of discussion*
Autobiography 1	8	3	2	7	5
Autobiography 2	4	1	5	6	6
Autobiography 3	8	2	4	6	6
Autobiography 4	4	3	1	8	4
Autobiography 5	11	6	3	3	9
Autobiography 6	12	5	1	6	6
Autobiography 7	9	4	3	5	7
Autobiography 8	9	5	4	3	9
Autobiography 9	7	3	2	7	5
Autobiography 10	15	6	3	3	9
Autobiography 11	6	2	4	6	6
Autobiography 12	12	5	3	4	8
Autobiography 13	15	4	4	4	8
Autobiography 14	15	4	2	6	6
Autobiography 15	7	4	4	4	8
Autobiography 16	8	6	5	1	11

Note: Intensity of discussion is the sum of 'Explicitly discussed' and 'Mentioned.'

> fighters' and their scholarly work was a 'foreign body' in institutes with completely different scientific foci. In the beginning, there actually were only two institutes with an explicit focus on the design of management information systems, the one in Linz founded by Peter Mertens and later in Erlangen-Nürnberg, as well as the Business Administration Institute for Organization and Automation at the University of Cologne … which was the first institute with several professorships related to electronic data processing …. (Autobiography 3, p. 73)

Moreover, the development of artefacts such as methods, concepts, or strategies (e.g., costing methods), rather than empirical research, was a core activity in the academic work of the pioneers and founders. As a consequence, their works were seldom published in top journals. Also, we found that management consulting has been a significant activity for business administration professors since the 1950s. Altogether, the impact of the business administration community on the genesis and development of BI was significant. Subjects like industrial management, organization theory, and accounting were of paramount importance.

Development facilitators and barriers

Ten informants explicitly discussed facilitators and barriers, reporting on organizations and individuals that positively affected the history of BI. The genesis and development of BI was significantly supported by computer companies (e.g., IBM Germany), software houses (e.g., mbp, Europe's first software house), as well as the top management of large companies with a need to operate IT systems (e.g., Siemens, DSL Bank, Kaufhof).[11] The strongest influence was exerted by IBM via trainee programmes, research fellowships for young scholars (e.g., IBM University, New York), postdoc programmes (e.g., in Yorktown Heights and San Jose), endowments of hardware and software, as well as funding of IT institutes and departments. Altogether, the computer industry had a significant impact on the history of BI.

Four out of the 10 autobiographies contain explicit statements about institutions and persons that impeded the genesis and development of BI. The Society for Informatics (Gesellschaft für Informatik, www.gi.de), as well as individual computer science professors, are mentioned as barriers. A major motivation for this behaviour was the intention to incorporate BI into informatics, as one specific form of applied informatics. The same goal, although to a lesser extent, was pursued by the German Academic Association for Business Research (Verband der Hochschullehrer für Betriebswirtschaft, www.vhbonline.org), which had the intention to incorporate BI as a specific management discipline. Both organizations made these attempts in order to incorporate the increasing teaching and research potential (e.g., new institutes and departments) into their own institutions. Also, these two organizations sought to avoid the reallocation of resources to BI institutes; particularly, they worked against the reduction of business administration and operations research resources. One informant tellingly described BI's fight against barriers, and also stated important reasons for the existence of these barriers:

> Despite the success of BI, especially during the last 25 years, a number of barriers had to be overcome in order to, first, introduce data processing on a grand scale in the early stages, and second, to establish BI as an autonomous discipline. These barriers were based on lack of knowledge and lack of understanding, inaccurate evaluations, skepticism and reservation, or intentional rejection. (Autobiography 13, p. 165)

Subject matter

Six informants explicitly discussed the topic of subject matter. In two of the six autobiographies the subject matter is not distinguished from the contents of curricula, indicating that BI legitimizes itself primarily via curricula. Hence, supplying practice with well-educated staff, rather than scientific research, was a major objective of scientific activity. Four further autobiographies touch on this topic (e.g., by stating objects that pertain to the subject matter of BI). The prevailing opinion among the informants is that the subject matter of BI is 'information and communication systems in

business and administration'. One informant, for example, wrote:

> The organization [as a whole] has always been at the core of research interest in the BI discipline. As in any other research domain, diverse perspectives emerged in the field, all of which addressed existing questions from their own points of view. (Autobiography 7, p. 107)

The finding that organizational information and communication systems are at the core of BI research is in line with a position paper on the nature of BI published in the 1990s (WKWI, 1994). Moreover, three informants discussed the importance of an ongoing discourse on the subject matter. Specifically, these persons indicated the necessity to enlarge the subject matter in the future, for example, by addressing topics pertaining to various levels of analysis, and not only those on the organizational level.

Objectives of scientific enquiry

Five informants explicitly discussed the objectives of scientific enquiry, and five others touched on it. Most important, no autobiography deals with a theory of BI or with explanatory models related to IS theorizing. In contrast, several informants explained BI's strong design and engineering focus, as exemplified in the following statement:

> In the beginning, most BI scholars were design-oriented. The apparent success of BI research was based on an engineering approach … From my point of view, the majority of BI scholars are still engineering-oriented today. (Autobiography 8, p. 122)

However, two autobiographies contain information about the use of theories from reference disciplines, and specifically mention systems theory and organization theory. This lack of awareness of the importance of theoretical research (i.e., the identification and test of cause-effect relationships) characterizes the founding generation of BI, as well as their successors.

Another major finding of the analysis is the 'glorification' of past achievements, with respect to design and action; a significant strength of BI has always been the distinct orientation towards the development of IT artefacts. Importantly, complementing the design and engineering focus by an emphasis on theory is considered a threat for the future development of the community (e.g., because this may result in a reduction of the community's success potential). However, this prevailing opinion stands in contradiction to the previously mentioned position paper (WKWI, 1994), because this document explicitly indicates theoretical research *and* design science research as objectives of scientific enquiry. According to one informant, contribution to theory had long been an important factor in BI research:

> In the midst of the 1990s, the theoretical foundation of articles was introduced as an explicit evaluation criterion: What is the state-of-the-art with respect to a specific object of research, and how does the paper at hand make a theoretical contribution? (Autobiography 6, p. 99)

A review of the overall group of commentaries, however, reveals that only two informants considered a theoretical focus to be an essential complement to the design-oriented research approach.

Research and development methods

Six informants explicitly discussed research and development methods, and three others touched on these topics (e.g., by stating specific research methods such as the case study). Such remarks notwithstanding, a detailed look at the data makes clear that most of the methods mentioned are not empirical research methods; rather, they are techniques for modelling business processes or development methods (e.g., prototyping), as is specifically noted by one of the informants:

> It became clear that not only is value added to a firm's products or services by activities that are directly related to those products or services, but supporting communication and information structures add value, also, to an organization. Based on this insight, an approach for communication structure analysis emerged. This approach is part of BONAPART, a tool for graphical modeling, documentation, and analysis of business processes, organizations, and information systems. (Autobiography 7, pp. 108–109)

Interestingly, the term 'development method' was not mentioned in any of the autobiographies, although BI has its primary focus on design-oriented research. Moreover, the method of 'research by development' (e.g., Szyperski and Müller-Böling, 1981), which thwarts an approach that considers findings of theoretical research in the development of artefacts (in other words: research first, development second), is mentioned in only two autobiographies. The following statement is a clear example:

> Our research efforts were based on the explicit belief that we cannot investigate our objects of study in the laboratory. Rather, we believed in investigations in the real world of existing organizations; that is, we pursued the strategy we preached – 'research by development,' thwarting the sequence 'research first, development second'. (Autobiography 16, p. 294)

Core areas in research and development

Five autobiographies include explicit discussions about research projects funded by the German Federal Ministry of Research and Technology or the German Research Foundation. Almost all of the mentioned projects are development projects, for which the outcome was the development of prototype software systems, as exemplified in the following statement:

> The apparent achievements of BI research were based on a construction-oriented approach. The above-mentioned program of the German Research Foundation in the period from 1985 to 1990 [Interactive Corporate Information and Controlling Systems] was characterized by modeling, development, and software prototype construction projects. In my view, the majority of BI scholars working today remain construction-oriented in their approach. (Autobiography 8, p. 122)

Thus, the explicit goal was the design and implementation of IT artefacts, and not theory development and testing, respectively. Most autobiographies do not contain discussions about specific themes addressed in the projects. However, six informants mentioned topics, particularly query-reply systems, executive IS, and computer integrated manufacturing. Basic research, as a significant and enduring source of technological innovation, is not mentioned in any of the autobiographies. Two informants discussed the tendency of BI to dwell on recent topics, so-called fads (Mertens, 1995; Steininger *et al*., 2009). Such a focus may negatively affect a cumulative research tradition, as well as direct comparisons of research quality, as is effectively exemplified in the following remark:

> In fact, a strategy could be observed which aimed at the establishment of local and small research domains and publication markets that are virtually unconnected, thereby impeding national and global quality comparisons in a putative intelligent way. (Autobiography 6, p. 101)

Also, it is discussed that BI should continuously scrutinize its core areas in research and development, thereby identifying promising new areas of enquiry. One informant, however, indicated that despite the large variety of possible topics, the fundamental question in BI is how IT systems can be effectively and efficiently designed, implemented, used, maintained, and renewed.

Curricula and programmes of study

Six informants explicitly addressed the topic of curricula and programmes of study, and another four autobiographies touch on the subject. The informants' narratives mention that the first BI courses were instituted in the mid-1960s, remaining part of business administration programmes until the 1970s. After that time, an increasing number of autonomous BI programmes have been established. The first specification of requirements for education in BI was developed in 1984, and this document was later continually updated. Importantly, not only academics but also practitioners contributed significantly to these specifications, particularly in the 1980s, as is explained by one informant:

> After I had expressed interest in this topic [participation in a curriculum committee], I was assigned the task of forming and chairing the next committee … Then, I have repeatedly worked out curriculum recommendations together with colleagues and practitioners since 1988, in which the major BI topics were documented, at least those topics that were considered to have useful teaching content. (Autobiography 8, p. 121)

The predominant group of contributors from practice were computer companies (e.g., Honeywell Bull, IBM), as well as large firms with a need to run IT systems (e.g., Hoesch, Siemens). The development of the specifications came about in the hope of implementation at all universities in the German-speaking countries. However, this hope was not always fulfilled, due to varying situational preferences (e.g., as a result of budget restrictions). It is also important to note that two informants mentioned that the specifications reflected BI's self-conception as academic field of study, and not as science.

Textbooks and journals

Two informants explicitly discussed textbooks and journals, and six other persons touched on this. One informant stressed that textbooks are a manifestation of an emerging discipline, and this person explicitly mentioned examples (Hartmann, 1961; Grochla, 1966; Mertens, 1966). The moment of the genesis of BI was dated to 1961, when a substantial monograph on the subject of BI was published by Hartmann, even though the publication was descriptive in nature (thereby making no claim to be a theoretical contribution) (Hartmann, 1961). With respect to BI journals, only *WIRTSCHAFTSINFORMATIK*, which published its inaugural issue in 1990, was mentioned (in seven autobiographies). One informant clearly expressed the significance of this journal:

> The most important German-language journal is *WIRTSCHAFTSINFORMATIK*. It is based on a tradition over 50 years long, at first under the name of *elektronische datenverarbeitung [electronic data processing]* … later *Angewandte Informatik [Applied Informatics]* … the renaming to *WIRTSCHAFTSINFORMATIK* in the 1990 volume constitutes a milestone in the history of BI. (Autobiography 4, p. 81)

Conferences

Nine informants either explicitly discussed or mentioned conferences attended by BI scholars and IT practitioners, such as the 1978 event 'Computer-Based Information Systems and Organization' ('Rechnergestützte Informationssysteme und Organisation'). Most of these conferences were focused on the description and design of systems. Consequently, theoretical research was rarely made the subject of discussion. From the early 1960s, many conferences were initiated and supported by practitioners, mainly by associations that were founded by computer companies. Examples include conferences organized by the Consortium Data Processing, which was founded in 1959 in Vienna (ADV – Arbeitsgemeinschaft Datenverarbeitung, www.adv.at) and whose first congress in 1966 attracted more than 700 participants, as well as BI symposia organized by IBM Germany starting in 1972.

The breakthrough for the community occurred in 1993 when the International Conference on Business Informatics was organized for the first time (Internationale Tagung Wirtschaftsinformatik); the conference attracted 560 participants, including both academics and practitioners (Kurbel, 1993). One informant tellingly described his motivation to help establish this conference:

> Annual conferences such as the International Conference on Information Systems (ICIS) or the Hawaii International Conference on System Sciences (HICSS) serve the purpose of discussing scientific progress. As well, based on corresponding doctoral consortiums, the conferences contribute to the qualification of young academics. This prompted me to assist in the establishment of similar competitive mechanisms in the German-speaking and European regions. (Autobiography 2, p. 68)

Since 1993, the conference has been organized every 2 years, and is now the largest and most prestigious scientific gathering in BI, thereby contributing significantly to BI's identity.

Professional organizations

The institutional integration of BI into the German Academic Association for Business Research, in the form of the designation as a specialized area, as well as the integration into the Society for Informatics as an interest group, was mentioned positively in three autobiographies. In a fourth document, however, this is viewed more sceptically. Four other informants mentioned both organizations, and one of those also referred to the German Society for Operations Research (Deutsche Gesellschaft für Operations Research, https://gor.uni-paderborn.de), which founded a BI working group in the 1970s. Importantly, one informant put forth the view that BI's lack of an independent professional organization is evidence of the weak scientific identity of the community:

> A remarkable detail … is the unsuccessful attempt of the establishment … of a BI association or society. In the early 1990s, criticism on the German Academic Association for Business Research and the Society for Informatics emerged in the scientific community … BI scholars expected an adequate representation, based on the discipline's gained significance. (Autobiography 5, p. 89)

Another informant argued that the goal of becoming perceived as an independent discipline, and of being accepted in that role, was a major motive for the establishment of an own association:

> Given the attempts of several computer scientists to deny the autonomy of BI in the 1980s, and to define it as a part of computer science, serious attempts were made to found an association for BI, in parallel and to compete with the Society for Informatics. As soon as influential computer scientists acknowledged the autonomy of BI, these plans were stopped. (Autobiography 4, p. 80)

However, there is agreement among most informants that BI's integration into the German Academic Association for Business Research and the Society for Informatics is adequate, with the implication that the development of an independent professional organization comparable to the Association for IS is hardly worth pursuing.[12]

Science and practice

The topic of science and practice is explicitly discussed in eight autobiographies, and five further informants mentioned it. In general, most informants indicated that there have always been close and fruitful relationships with practice, as exemplified in the following statement:

> As a consequence of the joint responsibility for the success in research by development, faithful and competent relationships with organizations and their executives have emerged during these times. As well, successful technological and organizational implementations and the stable use of the created systems contributed to the establishment of these relationships, which were effective much longer than the project duration …. (Autobiography 16, p. 204)

There is agreement among the informants that the demand for academically educated and trained staff was a major driver of the development of BI as a programme of study, and that the demand has positively affected the scientific development of the community. Moreover, the autobiographies indicate that time-consuming consulting activities in practice not only served the purpose of knowledge transfer, but also contributed significantly to a scholar's income:

> Another phenomenon also became visible, one which occurs in all scientific disciplines that have practical relevance … some peers did not overcome the temptation of time-consuming and financially alluring additional activities in practice …. (Autobiography 2, p. 67)

A majority of the informants hold the opinion that both research and teaching benefited from consulting activities; only one informant did not explicitly agree. This sceptical view is shared by stakeholders from outside the community (e.g., professors from other disciplines).

Knowledge transfer from science to practice started early. For example, many master and doctoral theses were written in collaboration with the computer industry (e.g., SAP). This form of liaison typically entails close relationships between practitioners and students, thereby stimulating mutual learning processes. Moreover, knowledge transfer from practice to science also occurred by way of lectureships, through which practitioners shared their experiences with faculty and students. As well, practitioners were appointed as professors, thereby ensuring transfer of knowledge from practice to academia. Such professors were typically former personnel from IT companies, management consultancies, or software houses, who had experience in academic teaching through lectureships (e.g., IBM staff members).

Reference disciplines

Reference disciplines were discussed directly by three informants, while another seven acknowledged the topic by mentioning specific disciplines. Two informants considered business administration as the 'mother' discipline, and one referred to the field as a 'sister' discipline. In two autobiographies the IS discipline is mentioned as a 'sister' discipline. Altogether, business administration is discussed more intensively in the autobiographies than is applied informatics and the IS discipline. There is, notably, general agreement among the informants that BI has its origins in business administration, from the standpoint that in the beginning business administration was BI's 'mother':

> Because the pioneers and supporters of BI – like most members of the successive founding generations – have been scholars from business administration, particularly management researchers and industrial engineers who were active in academic teaching and research, the question of the mother discipline is answered. It is business administration. (Autobiography 5, p. 86)

However, as time progressed and BI became increasingly more independent, this relationship with business administration changed, leading to the view, today, that business administration is BI's 'sister'. Applied informatics, in contrast, has always been a 'sister'. With respect to BI's relationship with the IS discipline, there is agreement among the informants that both are 'sisters', despite the insightful observation that they are perceived to be 'dissimilar sisters' because, although their subject matters are similar, their research approaches are significantly different, as is reflected by actual journal publications rather than journal policy statements (e.g., Chen and Hirschheim, 2004; Wilde and Hess, 2007).

Identification of patterns

Despite occasional disagreements with respect to specific facets, the prevailing opinion among the informants is that BI has gone through a successful development during the past five decades. Specifically, BI became independent from other disciplines, especially from business administration, and is now established in the scientific arena as well as in the broader society. The specific subject matter of BI developed primarily as a consequence of the increasing adoption of IT systems in organizations. This, in turn, created problems associated with IT design, implementation, use, and maintenance, as well as renewal. Consequently, the need for academically educated and trained personnel emerged – personnel who conceived that the effective and efficient design and management of IT systems implies a socio-technical perspective. With respect to the focus of scientific activity, design and implementation of IT artefacts, rather than theory-based explanation of IS behaviour, has dominated in BI. This fact, however, conflicts with the community's explicit commitment (WKWI, 1994) to consider theoretical and design science research as equal objectives.

Against this background, in the following section we seek to explain the dominance and advocacy of the design-oriented research approach in BI. Events important in the history of BI are integrated into the most recent version of the chronology of BI history, namely that of Heinrich (2011). Moreover, the historical development is described in a *sequence of phases* (see Figure 1). Because the phases reveal the temporal order of important events during the past five decades, both within each phase and among them, this concept is designed to 'determine patterns' (Mason *et al.*, 1997a: 315) that may explain the dominance and advocacy of the design-oriented research approach in BI. Importantly, the phases of the history have been generated inductively, based on the evidence provided by the informants, while the identification of patterns is based on the authors' deliberations. In the following section, we again include exemplary evidence from the autobiographies in the form of narrative statements.

1950s–1960s: becoming aware of a specific problem area

A specific configuration of circumstances, at a particular point of time, may result in the perception of a new problem area by scholars in existing disciplines. In the 1950s, business administration professors perceived the adoption of computers in organizations as significant – as a new and complex problem. As specific manifestations of this problem, the alignment of the organization to computer technology, as well as the customization of technology to organizational requirements, constituted a major challenge. Moreover, the significant differences in thinking and action between computer companies and client firms were another challenge. Hence, the exploration of the potential of computer system adoption in organizations was fuelled by interaction and cooperation among computer companies, client firms, and academics. These interactions were successfully established. One informant, for example, explained the situation as follows:

> Education and advanced training of clients became both a significant cost factor and bottleneck in the 1960s, which increasingly negatively affected tapping of market potential related to electronic data processing. As a consequence, computer firms developed a strategy that aimed to convince universities and technical colleges of the importance of teaching and research related to electronic data processing. As well, these firms supported the establishment of computer science professorships and corresponding curricula. (Autobiography 3, p. 71)

Also, the publication of significant works such as *Automation: The Advent of the Automatic Factory* by John Diebold (1952), which became a bestseller and had considerable impact on the scientific discourse (particularly among German business administration scholars), accelerated the fruitful genesis and development of BI.

At the end of this phase, the second BIFOA memorandum (BIFOA, 1969) was published.[13] This was the first document to systematically describe 'Organization and Data Processing' as a subject of academic teaching and research. Moreover, increasing public notice of the method 'research by development' advanced the design-oriented approach. Hence, in addition to the description of phenomena, the design of artefacts became an important objective of scientific enquiry.

1970s: becoming independent and expansion

Neither epistemological discourse, particularly discourse on the nature of BI, nor its establishment as an accepted scientific field, increased noticeably (Heinrich, 1975). Despite this, however, public funding to universities increased, leading to the introduction of more BI programmes, and thereby positively affecting the independence of the community. Moreover, the rapid and prosperous development of the computer industry (e.g., IBM), as well as aspired improvements in organizational productivity, had a positive influence on the development of BI. One informant unequivocally described the significant influence of IBM on the BI community:

> A factor that should not to be sneezed at was the impact of the IBM post-doc program on the emerging discipline of BI in the 1970s and 1980s. Several of today's BI professors were involved in one-year-long fundamental research projects in Yorktown Heights or San Jose, providing a basis for their habilitation treatises. (Autobiography 4, p. 81)

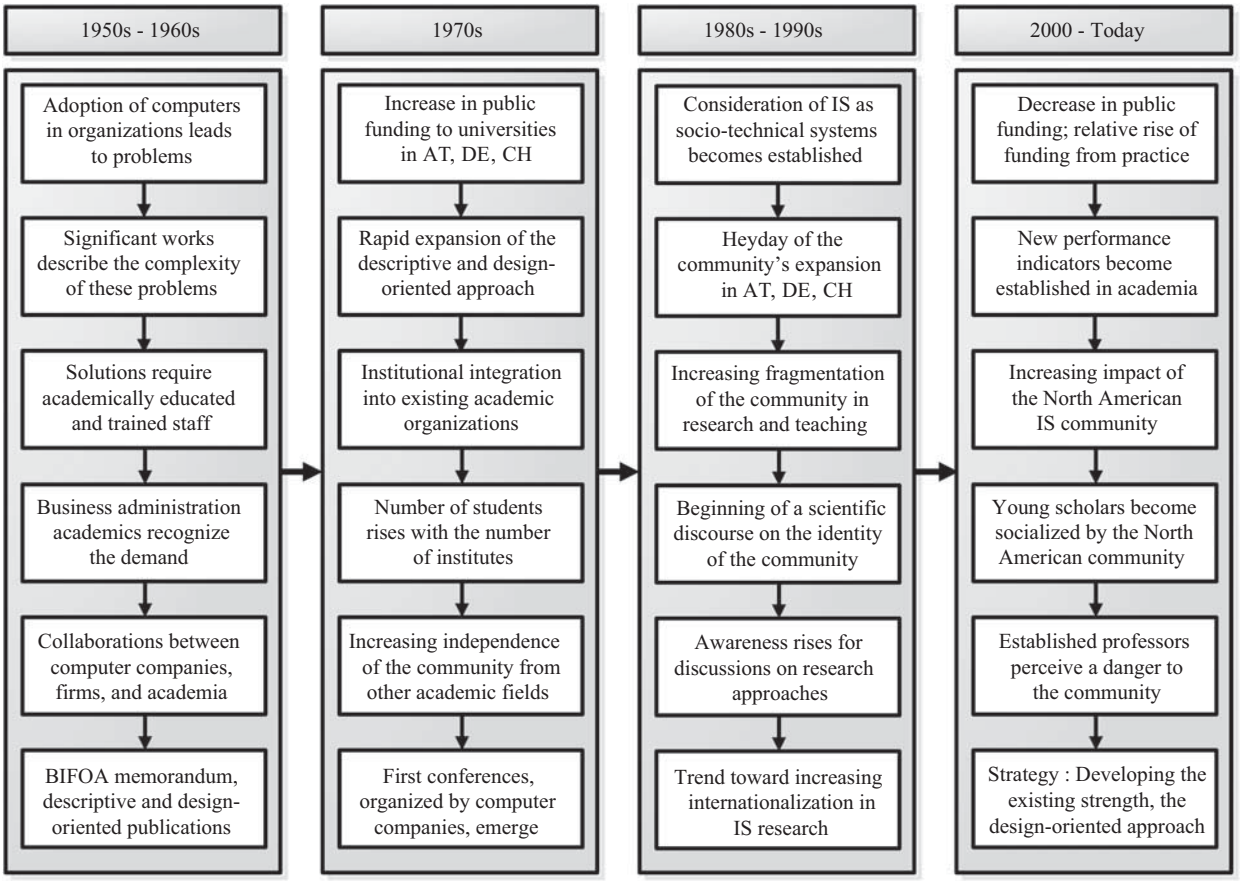

Figure 1 Sequence of phases on the history of BI.
Note: International Organization for Standardization (ISO) country codes: AT (Austria), DE (Germany), CH (Switzerland); BIFOA = Betriebswirtschaftliches Institut für Organisation und Automation an der Universität zu Köln (Business Administration Institute for Organization and Automation at the University of Cologne), IS = information systems.

Altogether, there was a notable growth of BI (in terms of the number of students and of institutes). As a result of the creation of an independent section in the German Academic Association for Business Research, and an interest group in the Society for Informatics, initiation of the community's institutionalization outside of universities took place. By the end of the 1970s, the first conferences were organized, mainly by computer companies, resulting in a higher degree of proliferation of the design-oriented research approach.

1980s–1990s: becoming a brand

By the late 20th century, computers had become pervasive in almost all organizations, and IS were increasingly considered to be socio-technical systems (e.g., Heinrich, 1986). Therefore, the demand for teaching and research increased. In particular, the development of artefacts played a significant role. In this era, BI experienced its heyday, and the term *Wirtschaftsinformatik* became a brand, both at universities and in practice. At this stage, most BI institutes were part of schools of business and social science.

As a consequence of the rapid expansion of BI, however, the community became increasingly more fragmented, and this, in turn, was often perceived as a threat to the community's identity (see, for example, Benbasat and Zmud, 2003; Hirschheim and Klein, 2003). One informant, for example, tellingly described the situation:

> There was too little concentration on a few primary streams, as well as partial divergence from the approaches of German-language BI research and international IS research. Against this background, I welcome the slow, yet permanently progressing development towards a reduction of interdisciplinary domains, which may be characterized best by 'nice to have'. (Autobiography 6, p. 103)

Also, an increasing degree of specialization in teaching and research impeded a holistic research approach, so that theoretical research and the design of IT artefacts were seldom combined. Some researchers began to investigate the community's self-conception. Specifically, the objectives of scientific enquiry, especially the questions of whether there should be a theory or engineering focus, and what research and development methods would be appropriate, became the subject of discussion (a Delphi study conducted in the 1990s by König, Heinzl, and colleagues may serve as an example; König *et al.*, 1995). This development indicated the necessity to discuss the community's academic legitimation, which was further substantiated by an increasing internationalization. Consequently, influences from the IS discipline, particularly from the North American community, increasingly affected the work of BI scholars. In 1997, five prominent BI scholars presented and discussed the 'German perspective on information systems' at the

International Conference on Information Systems (ICIS panel; Frank *et al*., 1997), signifying the increasing awareness within BI of the influences of other IS communities.

2000 – today: in the age of globalization

The increasing internationalization of the current era has become a major challenge, because research standards, in particular those from North America, differ significantly from established norms in BI. The BI community recognizes the influence of other regions, but it is now clear that BI itself has begun to affect other research communities. Notably, BI has been exerting influence on communities in the former Eastern Bloc, in Asia, and in Australia, 'exporting' the design-oriented research approach into these regions. Despite this development, however, the continuous decrease in public funding has necessitated that BI institutes keep their focus on applied research projects for which, in many cases, the theoretical bases are often not well-developed (e.g., Heinrich, 2005). Furthermore, new performance indicators have been instituted (e.g., requirements for numbers of publications in highly ranked journals).

Within BI, young scientists have increasingly sought opportunities to apply a behaviouristic research approach, with the result that ever more BI scholars have become socialized by other IS communities, especially by North America. A major reason for this development is the increasing pressure within academia to publish in top-tier journals, many of which are deeply rooted in the North American research tradition (e.g., *ISR*, *MISQ*). In combination with an emphasis on quantitative research methods, that tradition has been characterized as being based on behaviourism (e.g., Chen and Hirschheim, 2004).[14] One informant remarked pointedly on this issue:

> Most notably, the domain that is now referred to as an 'engineering-oriented approach' … is eclipsed unfairly. Because scholars in this domain have few counterparts in the US sister discipline Information Systems (IS), which pursues a strong behaviouristic approach, it is difficult for engineering-oriented scholars to publish papers in highly ranked US journals. The anonymous reviewers have dubious objections against the solution of practical IT tasks during various phases. (Autobiography 9, p. 129)

This development has led to an 'importing' of different views on the concept of science which, in turn, raises major questions: What is science, and what is it not? What research approach is best suited to BI? Established BI scholars, who are themselves proponents of the design-oriented research approach, have been forced into a defensive posture by these and similar questions. The major strategy these scholars perceive for resisting this trend is the development of the existing strength – the design-oriented research approach (Österle *et al*., 2011). In line with this development, a paper was recently published in *JAIS* in which BI scholars 'give recommendations on how the NAIS [North American Information Systems] community can mitigate some of its weaknesses … [by providing] insights into the traditional strength of the [BI] community' (Buhl *et al*., 2012: 236). This response confirms that BI scholars are not passive observers of the development towards a behaviouristic research paradigm. Rather, they seek to actively inform those IS scholars who are not design-oriented about (i) the opportunities associated with design orientation (e.g., practical utility) and (ii) the risks related to a purely behaviouristic orientation (e.g., decreasing student numbers).

From the past to the future

History research should not only describe historical facts and patterns of development, but should also provide 'wisdom that can be used effectively by leaders and decision makers' (Mason *et al*., 1997b: 259). Thus, history research should outline, at least to some degree, insights into possible future developments. One pivotal question for BI is whether the community should continue in its current direction, and if so, whether there are specific forms it should take.

Should BI continue the design-oriented research approach?

Although more than one hundred BI scholars, several of them ranked among the most established academics in the community, have signed the 'memorandum on design-oriented information systems research', many prominent BI scholars do not support the memorandum.[15] However, we do not believe that the lack of support for the document is because the scholars consider design-oriented research to be unimportant. Rather, evidence based on personal communication reveals that at least some of these scholars are of the opinion that the explicit accentuation of the design component is not necessary, because IS research consists *expressis verbis* (see, e.g., WKWI, 1994) of both theoretical *and* design-science research. We are not aware of well-founded arguments why one approach should dominate the other.

The genesis of BI has been driven by the practical problem of handling the complexity of computer systems in organizations. Afterward, throughout the history of BI, there has always been a close relationship with practice, so that the major stakeholder group to which BI has felt obliged was practice rather than other groups (e.g., researchers in or outside BI's own community). As a consequence, addressing 'How' questions has traditionally been more important than addressing 'Why' questions; the former is mainly associated with the design-science approach, while the latter is primarily related to theoretical research (König *et al*., 1996).

Developments during the past two decades, taking place outside the community, have both promoted and impeded the design-oriented research approach. On the one hand, decreases in public funding of scientific research necessitated an orientation towards practice in order to increase funding from this stakeholder group; BI's performance in acquiring funds from practice in order to conduct applied research has always been excellent. On the other hand, internationalization and new performance indicators (e.g., publications in highly ranked journals) have changed the behaviour of BI scholars, especially those of the younger generation. They are moving towards a behaviouristic and more theory-focused approach, because this is expected to provide a better chance for publishing in mainstream IS journals.

However, considering BI's significant past achievements in design-oriented IS research, as signified, for example, by the innovations of software companies developing

enterprise-wide systems (e.g., SAP), as well as contributions to the development of modelling notations (e.g., ARIS, Architecture of Integrated Information Systems), it is unlikely that the community will weaken its design focus. This appraisal is based on predictions of path dependence theory, which explains that current decision and action alternatives are dependent on past decisions and developments, even though past circumstances may no longer be relevant (Liebowitz and Margolis, 1995; Mahoney, 2000).

Should BI choose another form of its current approach?

Considering BI's historical development, it appears almost impossible for the community to give up the design focus for a concentration on theoretical research. At the very least, such a shift could take many years or even decades before the community's productivity would be comparable to the current status.[16]

But is the explicit preference for design-oriented research in the current form the only option for BI? We think *not*. One major alternative, or complement, would be to consequently pursue a *theory-driven design approach*. Although pioneering work on this approach was carried out in the 1980s and 1990s (e.g., Weber, 1987; Walls *et al*., 1992; March and Smith, 1995), renewed calls for theory-driven IS design were made in the recent past, both within the IS discipline (e.g., Markus *et al*., 2002; Gregor and Jones, 2007; Arazy *et al*., 2010) and in other fields such as psychology (e.g., Carroll, 1997) and human-computer interaction (e.g., Briggs, 2006).[17]

One fundamental assumption underlying the utility of this approach, however, is that the design of high-quality artefacts requires the explicit consideration of theoretical findings from behavioural research.[18] Although this assumption seems to be intuitively plausible, we are not aware of scientific research reporting empirical evidence that confirms such a notion. Thus, the provision of empirical evidence for this assumption should be a major endeavour in future IS research. A look at the possible outcome of such enquiries reveals two scenarios.

If empirical evidence was found (scenario 1), a 'theory-driven design approach' would constitute a fruitful direction for future BI research, because a historical strength would be further developed, and a traditional deficit, the theory focus (e.g., Heinrich, 2005), would be mitigated or even eliminated. The mentioned articles (e.g., Walls *et al*., 1992; Markus *et al*., 2002; Briggs, 2006; Gregor and Jones, 2007; Arazy *et al*., 2010) are promising starting points to establish a cumulative tradition in this field. Also, a chapter in the most recent edition of an established BI textbook illustrates, based on the example of the development of online shops and theories from cognitive decision making, how behavioural theories can be applied to design user-friendly systems (Heinrich *et al*., 2011: 395–403). In general, if this scenario was proven, the practical design value of behavioural IS research would be confirmed.

A major decision in scenario 1 is whether BI should focus on the application of theories, or on theory development *and* application. A pure application strategy would imply that BI scholars draw their design works upon theories developed by other IS communities (e.g., the North American or Scandinavian communities) or disciplines (e.g., psychology). This could be advantageous from a division of labour viewpoint, due to specialization effects. Also, increasing differentiation in a discipline indicates a rising degree of maturity (e.g., in physics various communities such as theoretical or applied physics coexist). However, it is also possible that BI not only applies theories on IS behaviour, but also contributes to their development, a strategy that has been touched on recently in the BI literature (Winter *et al*., 2009). Importantly, the journal *WIRTSCHAFTSINFORMATIK*, as well as the English-speaking equivalent *Business & Information Systems Engineering* (BISE), has recently established a department entitled 'Theories for BISE', signifying the increasing importance of theoretical research in BI, as well as the fact that BI seeks to contribute to both theoretical and design-science research.[19]

If no empirical evidence was found (scenario 2), however, the question arises of whether theoretical research based on behaviourism has more to offer than predictive value. Specifically, doubts will emerge about whether theories focused on IS behaviour at the individual, group, and organizational level are actually necessary for the design and implementation of artefacts. Because the identification of relevant theories and their goal-oriented application in a specific engineering context may be associated with significant investments, design and implementation could be managed more effectively and efficiently based on intuition, speculation, and an engineer's implicit know-how. Therefore, if evidence was found for this scenario, the current approach in BI is likely to result in a prosperous future. In contrast to scenario 1, no significant changes would be necessary.

Concluding comments

The objective of this article was to explain, on the basis of history research, the dominance and advocacy of the design-oriented research approach in BI, one of the largest IS communities worldwide. To this end, we applied an innovative research approach, namely autobiography, in order to explain what happened (see the descriptive results) and why (see the patterns, Figure 1). Because history research should also provide insight into possible future developments, we discussed whether BI should continue the current orientation towards the design of artefacts, and if so, whether there are specific forms of this orientation. Considering BI's achievements in design-oriented IS research during the past five decades, we argued, based on path dependence theory, that it is unlikely that the community will weaken its design orientation. Moreover, we explained that a focus on a 'theory-driven design approach' could constitute a viable direction for future BI research, because it makes possible the combination of scientific rigor and practical relevance. First, however, replicable empirical evidence must be found for a fundamental, yet hardly explored, assumption – namely that the design of high-quality artefacts requires the explicit consideration of theoretical findings from behavioural research. This research call is directed towards the entire IS community.

This investigation systematically reconstructs an important aspect of BI's history. However, we do not yet see this work as complete, nor do we consider it to be without

limitations. First, it is possible that future history research will reveal further descriptive facts about BI.[20] Obviously, new facts may lead to the identification of new patterns. Second, the presented interpretation of the facts and the resulting patterns cannot be free from our own, sometimes even unconscious, beliefs. In this context, the Hungarian-British polymath Michael Polanyi (1891–1976) argues in his book *Personal Knowledge* that objectivity is a false ideal, because all knowledge claims rely, at least to some extent, on personal judgments (Polanyi, 1958). Similar notions can be found in the IS literature. Mason *et al.* (1997a), for example, write that '[s]ometimes a history serves as a mirror of the researcher's beliefs' (p. 310), and Walsham (2006), citing the American anthropologist Clifford Geertz (1926–2006), writes: 'What we call our data are really our own constructions of other people's constructions of what they and their compatriots are up to' (p. 320).

History research is typically deeply rooted in a hermeneutic tradition, thereby being of a fundamentally idiographic nature. Such research, therefore, has the objective of providing 'richness in reality', and not 'tightness of control' (Mason *et al.* 1997a: 308). The entirety of the database underlying our analyses and interpretations (i.e., the sixteen autobiographies) is published in Heinrich (2011, chapter B). Other BI scholars may use this database to conduct their own analyses and develop their own interpretations. It will be rewarding to see what insights these potential studies will reveal.

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Notes

1 This fact is confirmed in the papers themselves. Frank *et al.* (2008), for example, write that '[w]e do not intend to provide a complete description of important historical events' (p. 393). The paper by Buhl and colleagues makes reference to the Ardelt and Heinrich project described in this article; Buhl *et al.* (2012) write that '[r]eaders who are interested in more comprehensive information about the … community's history and are familiar with the German language are referred to Ardelt and Heinrich' (p. 239).

2 Note that Österle *et al.* (2011) use the word 'descriptive' in a broad sense. Thus, their definition includes both the description of phenomena *and* theoretical research (i.e., the identification and testing of cause-effect relationships). According to a survey by Frank *et al.* (2008, p. 391), BI comprises 208 full professors.

3 It is important to note that contributors to the history of computing include historians (e.g., Mahoney, 2005; Schlombs, 2010), computing and IS researchers (e.g., Land, 2000; Cortada, 2004, 2008; Campbell-Kelly, 2009) and, occasionally, BI practitioners (e.g., Leimbach, 2008). These contributions, along with many related publications that appear in specialized journals such as *IEEE Annals of the History of Computing*, are a valuable base for future studies on the history of BI.

4 The German translation of autobiography is *Selbstzeugnis*.

5 The names of the 18 persons are indicated on page 1 of the inaugural issue. Given the listing of the 18 people, it was not possible to hide the names of those we approached, nor were we able to preclude some or add others.

6 The original German-language instructions may be obtained in electronic form by request from the corresponding author.

7 The four journals are: *Zeitschrift für handelswissenschaftliche Forschung (ZfhF)*, *Zeitschrift für Betriebswirtschaft (ZfB)*, *Zeitschrift Betriebswirtschaftliche Forschung und Praxis (BFuP)*, and *Zeitschrift Organisation und Betrieb*.

8 Despite the fact that we do not claim that the 12 categories are completely disjointed, a requirement that is virtually impossible to meet because several of the categories are interrelated (e.g., perceptions regarding research and development methods might present implications of perceptions concerning objectives of scientific enquiry, such as explanation or design), we believe that the 12 categories have a level of abstraction that is appropriate for the analysis of the data, as well as for the presentation of the results.

9 The narrative statements are literal translations of the original German-language statements.

10 The autobiographies may be obtained in electronic form by request from the corresponding author.

11 mpb denotes Mathematischer Beratungs und Programmierungsdienst (Mathematical Consulting and Programming Service), a software house founded in Dortmund (Germany) in 1957 by 14 companies; mpb was bought by EDS (Electronic Data Systems) in 1992 (Source: www.wikipedia.org).

12 The Business Informatics Association for Academia and Practice in Europe (Wirtschaftsinformatik-Verband für Hochschule und Praxis in Europa e. V.), which was founded in 1994, could not be established successfully and was therefore closed in 1995 (Heinrich, 2011: 268).

13 BIFOA = Betriebswirtschaftliches Institut für Organisation und Automation an der Universität zu Köln (Business Administration Institute for Organization and Automation at the University of Cologne).

14 It is important to note, as we have done in the introduction through arguments provided in Baskerville *et al.* (2011), that characterizing Anglo-Saxon IS research as being based on a behaviouristic approach over-simplifies the current situation. In particular, it is important to stress that policies of journals from this region do not dismiss research simply due to its approach.

15 For example, among the scholars who have not signed the memorandum are the current and a former editors-in-chief of the journal *WIRTSCHAFTSINFORMATIK*, as well as former spokespersons of the BI section in the German Academic Association for Business Research.

16 Metrics to measure productivity in a community with a focus on theoretical research are, for example, the number of publications in highly ranked journals or citations. In a community with a focus on design-oriented research, the number of patents or innovations adopted in practice may serve as examples for productivity measures.

17 See also a special issue on design science research (*MISQ*, Vol. 32, Issue 4, December 2008), as well as an article by King and Lyytinen (2004).
18 High quality could be measured, for example, based on technology acceptance or user satisfaction, as well as productivity parameters.
19 The current department editors are Armin Heinzl and Dorothy E. Leidner (September 2012, see www.wirtschaftsinformatik.de).
20 One promising avenue for future research is to select different samples; possibilities are choosing (i) other BI scholars of the founding generation, and/or (ii) scholars of younger generations. Another avenue is to select samples that provide insights from outside the community (e.g., scholars from other disciplines such as business administration or computer science). Moreover, it could be a fruitful avenue for future research to extend the focus of the investigation from '*who* says *what*' to '*who* says *what*, and *why*.' Because the entire data set underlying this article is published in Heinrich (2011), future research could draw directly upon these data to address this 'why' question.

References

Arazy, O., Kumar, N. and Shapira, B. (2010). A Theory-Driven Design Framework for Social Recommender Systems, *Journal of the Association for Information Systems* **11**(9): 455–490.

Ardelt, R.G. (2011). Geschichte der Wirtschaftsinformatik: Ein Instrument kritischer Selbstreflexion? Working Paper, Johannes Kepler University Linz.

Argarwal, R. and Lucas, H.C. (2005). The Information Systems Identity Crisis: Focusing on high-visibility and high-impact research, *MIS Quarterly* **29**(3): 381–398.

Back, A. (2001). *Lexikon der Wirtschaftsinformatik*, 4th edn, Berlin: Springer.

Barros, C.A. (1998). *Autobiography: Narrative of transformation*, Michigan: University of Michigan Press.

Baskerville, R., Lyytinen, K., Sambamurthy, V. and Straub, D. (2011). A Response to the Design-oriented Information Systems Research Memorandum, *European Journal of Information Systems* **20**(1): 11–15.

Benbasat, I. and Zmud, R.W. (1999). Empirical Research in Information Systems: The practice of relevance, *MIS Quarterly* **23**(1): 3–16.

Benbasat, I. and Zmud, R.W. (2003). The Identity Crisis within the IS Discipline: Defining and communicating the discipline's core properties, *MIS Quarterly* **27**(2): 183–194.

BIFOA (1969). Zweites Memorandum Betriebsinformatik und Wirtschaftsinformatik als notwendige anwendungsbezogene Ergänzung einer Allgemeinen Informatik, *elektronische datenverarbeitung* **11**(11): 544–548 (Reprinted in *Wirtschaftsinformatik* 2009, 51(1): 104–109).

Briggs, R.O. (2006). On Theory-driven Design and Deployment of Collaboration Systems, *International Journal of Human-Computer Studies* **64**(7): 573–582.

Buhl, H.U., Müller, G., Fridgen, G. and Röglinger, M. (2012). Business and Information Systems Engineering: A complementary approach to information systems – What we can learn from the past and may conclude from present reflection on the future, *Journal of the Association for Information Systems* **13**(4): 236–253.

Campbell-Kelly, M. (2009). Origin of Computing, *Scientific American* **301**(3): 62–69.

Carr, E.H. (1961). *What is History?* Cambridge: University of Cambridge & Penguin Books.

Carroll, J.M. (1997). Human-Computer Interaction: Psychology as a science of design, *Annual Review of Psychology* **48**: 61–83.

Chandler, A.D.Jr. (2009). History and Management Practice and Thought: An autobiography, *Journal of Management History* **15**(3): 236–260.

Chen, W.S. and Hirschheim, R. (2004). A Paradigmatic and Methodological Examination of Information Systems Research from 1991–2001, *Information Systems Journal* **14**(3): 197–235.

Cortada, J.W. (2004). How Did Computing Go Global? The Need for an Answer and a Research Agenda, *IEEE Annals of the History of Computing* **26**(1): 53–58.

Cortada, J.W. (2008). Patterns and Practices in How Information Technology Spread around the World, *IEEE Annals of the History of Computing* **30**(4): 4–25.

Davenport, T.H. and Markus, M.L. (1999). Rigor *vs* Relevance Revisited: Response to Benbasat and Zmud, *MIS Quarterly* **23**(1): 19–23.

Denning, P.J. (2005). Is Computer Science Science? *Communications of the ACM* **48**(4): 27–31.

Diebold, J. (1952). *Automation: The advent of the automatic factory*, Princeton: Van Nostrand.

Frank, U., Buhl, H.U., König, W., Krcmar, H., Mertens, P., Zmud, B. and Klein, H.K. (1997). German Perspectives on Information Systems: Research topics, methodological challenges, and patterns of exchange with IS practice, *ICIS 1997 Proceedings*, Paper 75.

Frank, U., Schauer, C. and Wigand, R. (2008). Different Paths of Development of Two Information Systems Communities: A comparative study based on peer interviews, *Communications of the Association for Information Systems* **22**(21): 391–412.

Gregor, S. and Jones, D. (2007). The Anatomy of a Design Theory, *Journal of the Association for Information Systems* **8**(5): 312–335.

Grochla, E. (1966). *Automation und Organisation*, Wiesbaden: Gabler.

Hall, E.C. (2000). From the Farm to Pioneering with Digital Control Computers: An autobiography, *IEEE Annals of the History of Computing* **22**(2): 22–31.

Hartmann, B. (1961). *Betriebswirtschaftliche Grundlagen der Automatisierten Datenverarbeitung*, Freiburg i. Br.: Haufe.

Heilmann, H. and Heinrich, L.J. (2006). Erkenntnisobjekte der Wirtschaftsinformatik, *HMD – Praxis der Wirtschaftsinformatik* **43**(250): 99–108.

Heinrich, L.J. (1975). Zum wissenschaftlichen Standort einer Betriebs- und Verwaltungsinformatik, *Angewandte Informatik* **17**(7): 265–268.

Heinrich, L.J. (1986). Wirtschaftsinformatik in Forschung und Ausbildung, *Information Management* **1**(1): 63–69.

Heinrich, L.J. (1988). Zeittafel zur Entwicklung der Wirtschaftsinformatik, in L.J. Heinrich and K. Kurbel (eds.) *Studien- und Forschungsführer Wirtschaftsinformatik*, 3rd edn, Berlin *et al.*: Springer, pp. 50–54.

Heinrich, L.J. (1992). Zeittafel zur Entwicklung der Wirtschaftsinformatik, in P. Mertens *et al.* (eds.) *Studien- und Forschungsführer Wirtschaftsinformatik*, 4th edn, Berlin *et al.*: Springer, pp. 63–68.

Heinrich, L.J. (1996). Geschichte der Wirtschaftsinformatik, in P. Mertens, D. Ehrenberg, J. Griese, L. J. Heinrich, K. Kurbel and P. Stahlknecht (eds.) *Studienführer Wirtschaftsinformatik*, Braunschweig/Wiesbaden: Vieweg, pp. 48–53.

Heinrich, L.J. (1999). Geschichte der Wirtschaftsinformatik, in P. Mertens, D. Ehrenberg, P. Chamoni. J. Griese, L.J. Heinrich and K. Kurbel (eds.) *Studienführer Wirtschaftsinformatik*, 2nd edn, Braunschweig/Wiesbaden: Vieweg, pp. 47–52.

Heinrich, L.J. (2002). Geschichte der Wirtschaftsinformatik, in P. Mertens, P. Chamoni, D. Ehrenberg, L. J. Heinrich, K. Kurbel (eds.) *Studienführer Wirtschaftsinformatik*, 3rd edn, Braunschweig/Wiesbaden: Vieweg, pp. 45–52.

Heinrich, L.J. (2005). Forschungsmethodik einer Integrationsdisziplin: Ein Beitrag zur Geschichte der Wirtschaftsinformatik, *NTM – Internationale Zeitschrift für Geschichte und Ethik der Naturwissenschaften, Technik und Medizin* **13**(2): 104–117.

Heinrich, L.J. (2011). *Geschichte der Wirtschaftsinformatik: Entstehung und Entwicklung einer Wissenschaftsdisziplin*, Heidelberg *et al.*: Springer.

Heinrich, L.J., Heinzl, A. and Riedl, R. (2011). *Wirtschaftsinformatik – Einführung und Grundlegung*, 4th edn, Heidelberg *et al.*: Springer.

Hirschheim, R. and Klein, H.K. (2003). Crisis in the IS Field? A Critical Reflection on the State of the Discipline, *Journal of the Association for Information Systems* **4**(10): 237–293.

Khazanchi, D. and Munkvold, B.E. (2000). Is Information Systems a Science? An Inquiry into the Nature of the Information Systems Discipline, *The DATA BASE for Advances in Information Systems* **31**(3): 24–42.

King, J.L. and Lyytinen, K. (2004). Reach and Grasp, *MIS Quarterly* **28**(4): 539–551.

Klein, H.K. and Hirschheim, R. (2008). The Structure of the IS Discipline Reconsidered: Implications and reflections from a community of practice perspective, *Information and Organization* **18**(4): 280–302.

König, W., Heinzl, A. and Poblotzki, A.von (1995). Die zentralen Forschungsgegenstände der Wirtschaftsinformatik in den nächsten zehn Jahren, *Wirtschaftsinformatik* **37**(6): 558–569.

König, W., Heinzl, A., Rumpf, M.-J. and Poblotzki, A.von (1996). Zur Entwicklung der Forschungsmethoden und Theoriekerne der Wirtschaftsinformatik: Eine kombinierte Delphi- und AHP-Untersuchung, in H. Heilmann, L.J. Heinrich and F. Roithmayr (eds.) *Information Engineering*, München/Wien: Oldenbourg, pp. 35–65.

Krippendorff, K. (2004). *Content Analysis: Introduction to its methodology*, 2nd edn, Thousand Oaks/CA: Sage Publications.

Krusenstjern, B. von (1994). Was sind Selbstzeugnisse? Begriffskritische und quellenkundliche Überlegungen anhand von Beispielen aus dem 17. Jahrhundert, *Historische Anthropologie/Kultur, Gesellschaft, Alltag* **2**(2): 462–471.

Kurbel, K. (ed.) (1993). *Wirtschaftsinformatik '93: Innovative Anwendungen, Technologie, integration*, Berlin *et al*.: Springer.

Kurbel, K., Brenner, W., Chamoni, P., Frank, U., Mertens, P. and Roithmayr, F. (eds.) (2009). *Studienführer Wirtschaftsinformatik 2009/2010*, Wiesbaden: Gabler.

Land, F. (2000). The First Business Computer: A case study in user-driven innovation, *IEEE Annals of the History of Computing* **22**(3): 16–26.

Land, F. (2010). The Use of History in IS research: An opportunity missed, *Journal of Information Technology* **25**(4): 385–394.

Lee, A.S. (1999). Rigor and Relevance in MIS Research: Beyond the approach of positivism alone, *MIS Quarterly* **23**(1): 293–307.

Leimbach, T. (2008). The SAP Story: Evolution of SAP within the German software industry, *IEEE Annals of the History of Computing* **30**(4): 60–76.

Lejeune, P. (1989). *On Autobiography*, Minnesota: University of Minnesota Press.

Liebowitz, S.J. and Margolis, S.E. (1995). Path Dependence, Lock-in, and History, *Journal of Law, Economics and Organization* **11**(1): 205–226.

Lyytinen, K. and King, J.L. (2006). The Theoretical and Academic Legitimacy: A response to Professor Weber, *Journal of the Association for Information Systems* **7**(11): 714–721.

Mahoney, J. (2000). Path Dependence in Historical Sociology, *Theory and Society* **29**(4): 507–548.

Mahoney, M.S. (2005). The Histories of Computing(s), *Interdisciplinary Science Reviews* **30**(2): 119–135.

March, S.T. and Smith, G.F. (1995). Design and Natural Science Research on Information Technology, *Decision Support Systems* **15**(4): 251–266.

Markus, M.L., Majchrzak, A. and Gasser, L. (2002). A Design Theory for Systems That Support Emergent Knowledge Processes, *MIS Quarterly* **26**(3): 179–212.

Mason, R.O., KcKenney, J.L. and Copeland, D.G. (1997a). An Historical Method for MIS Research: Steps and assumptions, *MIS Quarterly* **21**(3): 307–320.

Mason, R.O., KcKenney, J.L. and Copeland, D.G. (1997b). Developing an Historical Tradition in MIS Research, *MIS Quarterly* **21**(3): 257–278.

Mertens, P. (1966). *Die zwischenbetriebliche Kooperation und Integration bei der automatisierten Datenverarbeitung*, Meisenheim am Glan: Hain.

Mertens, P. (1995). Wirtschaftsinformatik – Von den Moden zum trend, in König W. (ed.) *Wirtschaftsinformatik '95, Wettbewerbsfähigkeit – Innovation – Wirtschaftlichkeit*, Heidelberg *et al*: Springer, pp. 25–64.

Neustadt, R.E. and May, E.R. (1986). *Thinking in Time: The uses of history for decision makers*, New York: The Free Press.

Newell, A. and Simon, H.A. (1976). Computer Science as Empirical Inquiry: Symbols and search, *Communications of the ACM* **19**(3): 113–126.

Österle, H., Becker, J., Frank, U., Hess, T., Karagiannis, D., Krcmar, H., Loos, P., Mertens, P., Oberweis, A. and Sinz, E.J. (2011). Memorandum on Design-oriented Information Systems Research, *European Journal of Information Systems* **20**(1): 7–10.

Polanyi, M. (1958). *Personal Knowledge: Towards a post-critical philosophy*, Chicago: University of Chicago Press.

Resch, A. and Schlögl, C. (2004). Die Wirtschaftsinformatik aus der Sicht ihres Hauptpublikationsorgans: Eine szientometrische Analyse der Zeitschrift Wirtschaftsinformatik/Angewandte Informatik, *Wirtschaftsinformatik* **46**(4): 302–310.

Schlombs, C. (2010). Productivity Machines: Transatlantic transfers of computing technology and culture in the cold war, Dissertations available from ProQuest. Paper AAI3414208.

Simon, H.A. (1996). *The Sciences of the Artificial*, 3rd edn, Massachusetts, MIT Press.

Stahlknecht, P. and Hasenkamp, U. (2010). *Einführung in die Wirtschaftsinformatik*, 12th edn, Berlin *et al*.: Springer.

Steininger, K., Riedl, R., Roithmayr, F. and Mertens, P. (2009). Fads and Trends in Business and Information Systems Engineering and Information Systems Research: A comparative literature analysis, *Business & Information Systems Engineering* **1**(6): 411–428.

Szyperski, N. and Müller-Böling, D. (1981). Zur technologischen Orientierung der empirischen Forschung, in E. Witte (ed.) *Der praktische Nutzen empirischer Forschung*, Tübingen: Mohr, pp. 159–188.

Walls, J.G., Widmeyer, G.R. and El Sawy, O.A. (1992). Building an Information System Design Theory for Vigilant EIS, *Information Systems Research* **3**(1): 36–59.

Walsham, G. (1995). The Emergence of Interpretivism in IS Research, *Information Systems Research* **6**(4): 376–394.

Walsham, G. (2006). Doing Interpretive Research, *European Journal of Information Systems* **15**(3): 320–330.

Weber, R. (1987). Toward a Theory of Artifacts: A paradigmatic base for information systems research, *Journal of Information Systems* **1**(2): 3–19.

Weber, R. (2006). Reach and Grasp in the Debate over the IS Core: An empty hand? *Journal of the Association for Information Systems* **7**(10): 703–713.

Wilde, T. and Hess, T. (2007). Forschungsmethoden der Wirtschaftsinformatik: Eine empirische Untersuchung, *Wirtschaftsinformatik* **49**(4): 280–287.

Wilson, F. (2000). *The Logic and Methodology of Science and Pseudoscience*, Toronto: Canadian Scholars Press.

Winter, R., Krcmar, H., Sinz, E.J., Zelewski, S. and Hevner, A.R. (2009). What in Fact is Fundamental Research in Business and Information Systems Engineering, *Business & Information Systems Engineering* **1**(2): 192–198.

WKWI, (ed.) (1994). Profil der Wirtschaftsinformatik, *Wirtschaftsinformatik* **36**(1): 80–82.

Wohlgenannt, R. (1969). *Was ist Wissenschaft?*, Braunschweig: Vieweg.

Wulf, W.A. (1995). Are We Scientists or Engineers? *ACM Computing Surveys* **27**(1): 55–57.

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