Bus Inf Syst Eng 64(4):529–540 (2022)
https://doi.org/10.1007/s12599-022-00759-7

DISCUSSION

Quo Vadis Information Systems Research in Times of Digitalization?

Reinhard Schütte · Frederik Ahlemann · Jörg Becker · Christine Legner · Christiane Lehrer · Manuel Wiesche · Gérard Richter

Published online: 27 June 2022

1 Towards Focused Interdisciplinarity and Research that Matters

Reinhard Schütte, Frederik Ahlemann

German business informatics ("Wirtschaftsinformatik") and the international IS community have had ongoing discussions about our discipline's subject matter for several decades. These discussions have touched on the discipline's core, its identity, as well as its rigor and relevance (Akhlaghpour et al. 2013; Becker et al. 2015; Benbasat and Zmud 1999, 2003; Bichler et al. 2016; Davenport and Markus 1999; DeSanctis 2003; Desouza et al., 2006; Galliers 2003; Heinrich 2011; Österle et al., 2010; Robey 2003; Sidororva et al. 2008; Straub and Ang 2011; Weber 2006, 2011). Recent online debates have demonstrated that no final and comprehensive consensus has ever been reached across all the years and arguments (e.g., Hassan 2021, and the subsequent discussion). We can, nevertheless, live with some questions not having a final answer as yet. However, we are convinced that all areas of life's far-reaching digitalization are reasons for rethinking our discipline's core.

For many years, business informatics regarded itself as the discipline for explaining and shaping the interplay between organizations, individuals, and information technology artifacts. It has, nonetheless, become clear that this unique selling point no longer exists. Colleagues from the fields of applied computer science, business administration, engineering, and other disciplines are—more than ever—dealing with questions that would previously have been assigned to business informatics and IS. The various fields' perspectives and methodical approaches differ, which should in no way obscure the fact that distinguishing these fields from our discipline is becoming increasingly difficult. This difficult demarcation is not necessarily a problem for productive scientific work, since it opens the way to valuable transdisciplinary collaboration. However, it might pose a considerable challenge for three areas in terms of a discipline development perspective: (1) In teaching, disciplines increasingly compete for students with the same preferences, inclinations, and talents. It is important to differentiate one's study programs and offer an attractive profile to attract good students. (2) In the competition for structural research funding, small disciplines, such as business informatics, might fall behind—especially if

R. Schütte (✉) · F. Ahlemann
University of Duisburg-Essen, Essen, Germany
e-mail: reinhard.schuette@uni-due.de

F. Ahlemann
e-mail: frederik.ahlemann@uni-due.de

J. Becker
European Research Center (ERCIS), University of Muenster, Muenster, Germany
e-mail: becker@ercis.uni-muenster.de

C. Legner
Faculty of Business and Economics (HEC), University of Lausanne, Lausanne, Switzerland
e-mail: christine.legner@unil.ch

C. Lehrer
Copenhagen Business School, Copenhagen, Denmark
e-mail: cl.digi@cbs.dk

M. Wiesche
TU Dortmund University, Dortmund, Germany
e-mail: manuel.wiesche@tu-dortmund.de

G. Richter
McKinsey & Company, Inc, Taunustor 1, 60310 Frankfurt, Germany
e-mail: gerard_richter@mckinsey.com

research sponsors assume that their size or perceived disciplinary core signal that they cannot contribute to solving central societal challenges. (3) When research fields develop and grow fast, there is a risk of small disciplines without a clear core losing their focus and only making marginal progress with respect to knowledge production since they are seldom involved in cumulative research processes.

Given these observations, it seems imperative to revisit our discipline's intellectual core and scientific goals (Heinrich 2011)—the truly important aspects of our identity. The two following theses on business informatics' object of inquiry and its relevance could serve as a sustainable delimitation with clear differentiation potential.

Thesis 1 Business informatics' object of inquiry should emphasize interdisciplinarity even more strongly. Business informatics problems require three perspectives: technology, organization, and economic efficiency.

The traditional way of delineating a discipline is to specify its object of inquiry and its scientific goals. This is a scientific value judgment, which is usually the result of discourse in a scientific community (Albert 1991). Consequently, a discussion about business informatics' object of inquiry seems to be warranted, since there should be a struggle to arrive at such a value judgment instead of the contrary delineation based on orientation, persons or institutions (Heinrich 2011, p. 232), or on existing research practices.

Business informatics regards itself as an independent discipline, meaning that against the backdrop of the development described above there is a constant need to distinguish its object of inquiry from those of business administration and computer science. While business administration focuses on business activities (Zelewski 1999), computer science deals with the computer-based processing of information (Coy 2001). On the other hand, business informatics focuses on the (socio-technical) information system as an object of inquiry (Österle et al. 2010). Some researchers extend this definition to include information infrastructures and information's function (Heinrich et al. 2011). Other authors have recommended taking the IT artifact into consideration (see Benbasat and Zmud 2003), which subsequent community discussions of course challenged (e.g., DeSanctis 2003; Galliers 2003). Both approaches have a common feature—they do not sufficiently differentiate business informatics from its direct neighboring disciplines: On the one hand, in business administration, researchers increasingly study application systems as tools for supporting decision making. For instance, Big Data or artificial intelligence (AI) approaches are used for marketing mix decisions or to optimize supply chains. On the other hand, in computer science, decisions about the scope of automated information processing are the subject of scientific investigations (e.g., in software engineering). Computer science therefore also takes the non-automated processing of information (contrary to the automated processing by means of application systems) into account at times. Further, information systems currently also play a role in other disciplines—examples include the sociology of media or engineering disciplines, such as mechanical engineering. The level of digitalization reached in companies and society has resulted in many scientific disciplines dealing with issues that might be regarded as "traditional" business informatics' objects of inquiry.

In recent years, business informatics has changed its character, specifically by turning toward the international information systems community, which entails a clear focus on the interactions between technologies and individuals, groups, companies, or societies (Recker 2021). This new orientation has not, as yet, provided a satisfying answer to the question of our object of inquiry. Therefore, the authors suggest that the discipline should concentrate more on taking the economic efficiency aspect into account when defining the core of our discipline. This had previously been done, since it was always included in the original terms characterizing the discipline (e.g., "business information systems" or "management information systems").

Economic efficiency is required when resources are only available in limited quantities (scarcity of resources) and, in the light of the given goals, should therefore be used as effectively and efficiently as possible. Furthermore, an economic information systems design can hardly be completed without a minimum understanding of the technical artifact. Moreover, in the context of economic activity, a socio-technical information systems analysis necessarily requires an interdisciplinary research field (DeSanctis 2003)—one using theories from different disciplines (Agrawal and Lucas 2005)—resulting in three fundamental business informatics research constituents (Ahlemann et al. 2021):

1. Business Informatics research presupposes that there is an information technology artifact. This technical artifact is, at least fundamentally, understood (not just represented as a black box). This implies an understanding of the design and the implementation process, as well as of the use context.
2. The technical artifact's use occurs in a system with social elements. The social aspects need to be integrated because individuals' appropriation and use of the artifact influence its mode of action.
3. Resource constraints are found in all organizations' actions. This situation requires economic design,

implementation, use, and the management of information technology artifacts, as well as an answer to the question of whether their use results in added values. In other words, it is not only a question of developing software to meet users' requirements but also of software's successful use in organizations, as reflected in an organization's success.

We are convinced that research should increasingly address business informatics' interdisciplinarity, with business informatics research projects analyzing at least two of the three constituents. For example, a minimum understanding of an ERP system's technical architecture should be a precondition for studying its impact on a firm and its economic success. A mere analysis of the system's effects without investigating the technological characteristics should be classified as business administration research, as this studies economic actions insofar as they take place in enterprises (Zelewski 1999, p. 24). Conversely, developing a process model to introduce software without also considering social and economic effects can only be attributed to computer science, but not to business informatics. Accordingly, in business informatics, interdisciplinary research always embraces three constituents: It is about (1) technical artifacts and their specific properties, as well as (2) these properties' effect on organizations (in the widest sense), and (3) it considers resource constraints.

Thesis 2 Information systems should address practically relevant problems of high complexity and avoid model platonism.

Against the background of thesis 1, it is obvious that business informatics has developed both behavioral and design-oriented forms of research. It derives its high "practical relevance" from the latter, which, however, is conducted in a very dynamic and constantly evolving knowledge field. In addition, high socio-technical and economic complexity characterizes many practically relevant problems, posing a further challenge to practically relevant (design) research. To conduct research in this environment, the phenomena first need to be understood in a comprehensive way. There are various methodical approaches to gain this understanding. Malik (2013) once formulated the "verstehende Begleitung" of business practice for business administration, which might be a feasible approach, while various empirical social research methods could also be considered. If there is no understanding, there is a danger that isolated sub-problems might be chosen as the research subject, which may be accessible and easy to publish, but whose relevance is limited or no longer given.

These "practical pseudo-problems" exist, for example, when the subject matter is, for complexity reduction reasons, limited to such a degree that the research results' practical usefulness is marginal. From a philosophy of science perspective, researchers increase the information content of the "if" part of an "if–then" statement in such instances, which reduces the statement's overall information content. In other words, the researchers specify an increasing number of boundary conditions limiting the research findings' general applicability. This leads to problems of exclusion, because the problem's (practically) relevant aspects are excluded due to methodical decisions and these are therefore not included in research. This exclusion results in another problem: misinterpretation. Misinterpretation occurs when an analysis of the real problem's excluded aspects could have led to findings contradicting the actually generated ones.

Both the exclusion and misinterpretation problem are exacerbated by overly pragmatic publication practices. From our perspective, "verstehende Forschung" is not given sufficient scope in our community's prestigious journals. Established research methods and scripts motivate researchers to greatly reduce real-world problems' complexity. Researchers who do so enjoy career advantages, because they have more publication success. Not surprisingly, the consequence of such success and advantages is far too often that practical relevance falls by the wayside.

According to Albert, these developments can also be characterized as model platonism, because an excessive number of boundary conditions make theoretical propositions' empirical testability increasingly difficult, up to the point that testing in the field becomes impossible (Albert 1963, 1967, 1998; Kapeller and Ferschli 2019). Consequently, many relevant real-world problems are no longer in the focus of business informatics. For example, more complex "enterprise computing" problems no longer find their way to our discipline's reputable publication outlets. Given the integration problem, research into how complex ERP systems can be designed on the basis of modern architectural approaches, such as "cloud-native computing," is highly relevant. Little to nothing is being done in this respect—the process of understanding the problem is just too lengthy and attempts to "trim" the complex research results to fit "journal-compatible" formats is overly futile. How credible is an applied research discipline that excludes entire problem classes with high practical relevance, just because the results are hard to publish?

We see a real demand for our discipline to discuss our research's relevance more critically so that the problems associated with model platonism can be reduced or, at best, solved. Simultaneously, we need to start a new discourse on publication pressures leading to methodological standards, which further exacerbate the problem.

Focusing on relevant practical problems, while simultaneously considering complex interdependencies in the social, technical, and economic spheres, is required in order

to justify our discipline's existence. Business informatics should learn from past mistakes and reflect on the value of working on complex, relevant problems. We specifically wish to emphasize that the demand for rigor in research does not contradict the latter.

2 Information Systems Research Between Changes and Stability—Some remarks to Reinhard Schütte´s and Frederik Ahlemann´s Theses

Jörg Becker

To start with, it may be a good idea to reflect on the "heart" of a discipline from time to time and to observe if the focus is shifting in a specific direction or to require that it should be doing so. In that sense Reinhard and Frederik interpret "Quo Vadis" as both, as "where our discipline is going to" and "where it should be going to". Let me say that I agree with some main points which Reinhard and Frederik make. Yes, there have been a lot of changes our discipline had to face. When I started my career as a young professor in 1990, we did not have something like "Internet" (at least not in the sense we use it today). A couple of years later, Otto K. Ferstl, an esteemed colleague of the University of Bamberg, proposed "E-Mail" as a means of communication between the professors of Wirtschaftsinformatik which we all were very curious about. SAP offered R/2, then R/3 as client–server-technology, and later S/4HANA. Process Management, Data Warehouses, Business Intelligence, E-commerce and E-business (some said E-everything), Artificial Intelligence (again!), Cloud Computing, Blockchain, Data Science, CIO, CDO, Angela Merkel´s "IT-Summit", which changed to "Digital Summit", all were buzz words that we had to deal with (and still do). In light of this, our students constantly have to learn new technologies and a changed use of technology.

But there are things that are stable:

- Information systems are socio-technical systems (technical IT applications and the use of these systems) that we, as a discipline, have to understand, to describe and to explain (behavioral aspect) as well as to design in a way to support organizations in an effective (functional aspect), efficient (economical aspect) and user-friendly way (design aspect). That implies two things: the design of *IT systems* to support the processes and the design of *processes* induced by IT systems. Both aspects strongly interact with each other. To understand information systems as *socio*-technical systems has been at the center of our discipline from the very beginning and is not something new.
- The two main aspects of information systems that can be described and designed are data and processes. Data represent the static aspect of information systems. Data structures are quite stable over time (when designed properly, but that is a different topic). There was a focus on data in the eighties and nineties where "company-wide data models" were in fashion. Now, we face a new hype about data under the umbrella of "data science" ("data as the oil of the future"). While "company-wide data models" had the data of operational systems in mind (as the basis of ERP systems), "data science" focuses on the analytic and reporting aspects of data. Artificial Intelligence and Machine Learning came into place. Processes deal with the flow of data, with the sequence of tasks. Hammer and Champy (1993) had a great influence on the scientific discussion on processes, as had Scheer (1992). Both, data science and process management (moving into direction of process science (vom Brocke et al. 2021)), are heavily discussed in the scientific community and in practice.
- The specifics of our science ("WirtschaftsInformatik") brings together knowledge of business and economics ("Wirtschaft") on the one hand and informatics ("Informatik") on the other. Both "mother disciplines" (business and informatics) focus on one of the two aspects. I conceive "economic" in a broad sense (dealing with the domain "economics") and not only as an equivalent to "efficient". The "brother disciplines" (Geo-informatics, Bio-informatics, medical informatics) each have different domain core areas. They overlap with our discipline, especially in terms of their methodologies. There is a continuum of research areas between business/economics and information systems as well as between information systems and informatics. But do we have to give up our core research area and do we have to move to somewhere else? I do not think so. Our study programs are much in demand, we are increasingly establishing our discipline in the scientific community, and the economy (practice) exhibits an unbroken demand for our students and our advice. If other disciplines deal with similar research questions (and I do not use the term "take over"), fine with us! Good ideas are born in each discipline. It is fantastic when disciplines cross-fertilize. A propos "establish our discipline": only recently has the German Research Foundation (DFG) explicitly established "Wirtschaftsinformatik" as a research class which is part of the social sciences and humanities (business and economics) and of engineering (informatics). It is the fate of "in-between"-sciences that they do not belong solely to one superordinate research group.
- The design aspect and the behavioral aspect live in a wonderful symbiosis in our discipline. The one cannot

Table 1 examples for different aspects of the information systems discipline

	Method focus	Domain focus
Design oriented	Develop a new method and a system to process models; Design and implement a flexible and robust (against changes over time) data warehouse structure	Develop a reference information model for retailers; Design and implement an AI based system to recognize "hate speech"
Behavioral oriented	Analyze the user behavior when applying AI techniques; Analyze the diffusion of new technologies	Apply user acceptance models for E-government; Describe and analyze the diffusion of E-commerce from a supplier perspective and a customer perspective

survive without the other. Design science (sometimes misunderstood as science less consulting) and behavioral science (sometimes misunderstood as useless l´art pour l´art) have to go along with one another. The design aspect should always endeavor to deal with problems that are real (exist in the real world) as the behavioral aspect does ("does anybody care?"). We have to ensure that both are in a good balance. I agree with Reinhard and Frederik that it is harder to get good design science research placed in best ranked journals than good behavioral science research. But let´s keep on working on this (rather than giving up this important part of our discipline).

- To bring together the main aspects of the last two bulletin points: Information systems as a discipline has a method focus and a domain focus and is design science oriented and behavioral science oriented. Some research examples are shown in Table 1.

As you might see: I am quite optimistic about the goal and the core area of our discipline. All aspects have to be in good balance, and we neither have to shift our research area nor to give up research topics. That other disciplines deal with similar research questions is an enrichment and not a threat for our discipline. Digitalization is a huge field and *has to* be addressed in the research of different fields.

3 Back to the Academic Roots—The Sociotechnical Perspective as the Essence of IS Research

Christine Legner

Business informatics and the information systems (IS) discipline have been studying the design, exploitation and uses of digital technologies for decades. However, with the convergence of social, mobile, analytics, and cloud computing, digital technologies have become pervasive in organizations, society and our private lives. For IS scholars, this unprecedented wave of digitalization creates opportunities and challenges (Legner et al. 2017). On the one hand, it allows the IS discipline to grow and provides manifold opportunities to engage in innovative research activities with high visibility. This rapid growth, however, entails the risk of fragmentation. On the other hand, our neighboring academic disciplines are catching up quickly and embrace themes that have traditionally been considered IS research topics. With this growing inter-disciplinary competition, IS scholars risk losing their uniqueness and raison d'être. Against this backdrop, defining the IS discipline's identity and core is paramount to ensure a coherent expansion and avoid erosion in the current wave of digitalization.

In the following, I will comment on Schütte and Ahlemann's introductory statements and develop three suggestions for the core of the IS discipline.

3.1 Defining the Object of Inquiry—The Sociotechnical Perspective as "Axis of Cohesion"

Schütte and Ahlemann rightfully state that business informatics has to clearly define its object of inquiry. Consistent with their argumentation, promoting the IT artifact as distinctive characteristic of IS research puts the emphasis on the technical side of IS research. It would imply that important IS research streams (for instance, "Digital Business Management and Digital Leadership" or "Economics of IS" which are two of the six Departments in the BISE Journal) are not considered part of the discipline's core. A much more compelling approach is to emphasize the sociotechnical tradition of the IS discipline, which emphasizes the interactions between IT artifacts and the individuals and collectives that develop and use the artifacts in their social (e.g., psychological, cultural, and economic) contexts. In their MISQ research commentary, Sarker et al. (2019) argue that IS "has lost sight of the discipline's sociotechnical character that was widely acknowledged at the discipline's inception". Based on Abott (2002)'s work on the nature and progress of academic disciplines, the authors suggest renewing the sociotechnical perspective as "axis of cohesion" and distinctive and coherent foundation for the IS discipline. Along this "axis of cohesion", they identify six categories of IS research themes with varying degrees of presence of the social and the technical in conceptualizing IS phenomena: On one end of this continuum are studies with pre-dominantly social focus where social theories are

applied, extended or tested in IT-related or IT-mediated contexts. On the other end are the predominantly techno-centric studies that aim at developing or improving the technical components where the social context is in the background. In between, we find the four categories where the focus of IS research should be placed. Interestingly, Sarker et al. (2019) also observe a very uneven distribution in the articles published in the most prestigious IS journals MISQ and ISR, where a social rather than sociotechnical focus prevails. To ensure a coherent development of our discipline, IS scholars need to clearly position their object of investigation on the social-technical continuum and avoid focusing exclusively on the two extremes of the continuum.

3.2 Investigating the Core—Strengthening IS Theoretical and Methodological Foundations

A clearer sociotechnical focus does not only allow clarifying the object of inquiry in IS research, it also helps strengthening the theoretical and methodological foundations of the discipline. In her seminal paper on the Nature of Theory in IS, Gregor (2006) identifies four central research goals: analysis, explanation, prediction and prescription. While the view of theory as providing explanations and prediction and as being testable prevails in social sciences, sociotechnical phenomena are often complex and represent "wicked" problems that are difficult or impossible to solve. Accordingly, IS researchers have been creating "theories for analyzing", in the form of taxonomies or conceptual models, which are the foundation for understanding and theorizing on sociotechnical systems. IS research also has a strong tradition in creating artifacts that help solving "wicked problems" as results of design-oriented research. If we want to keep our discipline's identity, this also calls for maintaining the distinct IS tradition with regards to theoretical contributions and research methods, which are often challenged in academic peer-review processes.

3.3 Expanding the IS Discipline—Addressing Grand Challenges through a Sociotechnical Lens

The IS community's background and sociotechnical perspective make it a potentially highly relevant contributor to address the grand societal challenges through digital technologies and innovation. This implies that IS expands beyond the established enterprise-centric thinking and takes a prominent position in fields that are highly impacted by digitalization, such as sustainability, health or crisis management. Such an expansion reinforces the need for inter- and transdisciplinary research beyond the ideas formulated in the introductory statements by Schütte and Ahlemann as it includes not only economic objectives and resource constraints, but requires balancing individual, organizational and societal goals. It also calls for engaging with a broader set of research communities, including the specific domains, such as medicine, engineering or energy, as well as law, psychology and many others. The sociotechnical perspective as "axis of cohesion" can help to position IS research in inter- and transdisciplinary research programs and provide unique contributions to the design, management and use of digital services, platforms and (critical) infrastructures in these fields.

To conclude, getting back to our academic roots and sociotechnical tradition could help IS researchers to provide a distinctive and coherent foundation for the discipline, but would need adjustments in the way we position our research and select the objects of inquiry.

4 Tackling Society's Grand Challenges

Christiane Lehrer

It is interesting to note that it is precisely the success of information technologies (IT) that has led to an identity crisis within the German business informatics ("Wirtschaftsinformatik") and the international Information Systems (IS) community. There is concern that other disciplines are increasingly addressing issues related to digitalization that have long been the sole home turf of our discipline. Thus, for decades, the core of our discipline has been debated in order to achieve sufficient differentiation (e.g., Benbasat and Zmud 2003; DeSanctis 2003; Galliers 2003; Walsham 2012). A central question in the debate until today is what constitutes the subject matter of IS research: do we need a clearly defined core and, if so, what should it contain?

While business informatics has traditionally focused on organizations, especially businesses, with an emphasis on design science, the international IS community has long been much broader, dealing with socio-technical systems in relation to individuals, organizations and society. However, an increasing diversity of research topics and approaches can also be observed in business informatics. While some may be concerned about this (growing) diversity and possible dilution of our discipline, I would argue that business informatics and IS research have indeed established a clear profile that is distinct from other disciplines—a clear focus on information systems, which are viewed as socio-technical systems in which people interact with technology within a particular social context to achieve instrumental (e.g., performance) and/or humanistic outcomes (e.g., well-being). This focus, combined with a deep understanding of IT artifacts, still sets us apart from the purely technological or purely social and/or management disciplines. This also

applies to the topics and research questions that are examined with regard to digitalization, if one looks beyond the surface of general buzzwords.

4.1 Embracing Socio-Technical Phenomena in a Variety of Settings

When it comes to the question of which topics and issues should be part of the core of IS research, I support a broad understanding of the subject matter of IS research. Given the pervasiveness of IT in business and society, the scope and importance of our discipline's subject matter has grown tremendously. This should also be reflected in the community's research activities. In my view, the relevant settings and issues are broad and extend beyond companies and public institutions. Relevant socio-technical phenomena also occur in the context of, for example, health, education, sustainability, and development at the individual, organizational, and societal level. A sole focus on the use of IT in organizations, especially companies, and thereby "returning" to the origins of business informatics or management IS seems to be a step backwards rather than a step forwards. This would leave the playing field to other research disciplines in areas where our discipline can certainly make relevant contributions.

From my perspective, it is an opportunity rather than a threat that the IS and increasingly the business informatics community address a variety of aspects related to digitalization and IT. Only in this way can we, as a discipline, provide answers to socially relevant issues and contribute to addressing major challenges posed to individuals, organizations and society. It allows us to engage in contemporary debates that can unleash societal impact. In fact, answers to big questions of today are increasingly demanded by our stakeholders—students, practitioners, and the society at large.

At the same time, it cannot be denied that a wide understanding of IS leads to overlaps with other disciplines in some areas. But is this an opportunity or a threat? In my opinion, it is, above all, an opportunity for long-demanded interdisciplinary dialogue and collaboration, which without question brings with it all the well-known challenges. Nevertheless, I believe we have more to gain than to lose. Thus, instead of obsessively delineating and retreating to a core that leaves many relevant issues aside, we are better served to embrace the full potential of digitalization.

4.2 Extending from Business to Societal Value and Impact

There is no doubt that IS research must be and remain relevant to its stakeholders. For this purpose, our discipline needs a multidisciplinary research agenda based on the socio-technical paradigm that addresses real and relevant problems and that contributes to tackling the grand challenges of our time. In a world struggling to meet the UN Sustainable Development Goals, which include climate change, inequality, and health, responsibility cannot be delegated to governments alone. Thus, research with societal value and impact is increasingly important. Therefore, the IS community would benefit from advancing research in this direction.

To achieve these objectives, our discipline is well-positioned. The socio-technical paradigm gives us a strong starting point to study both the positive and negative impacts of IT in society. Moreover, we can benefit from the diverse perspectives and methods that are prevalent in our community. However, addressing the grand challenges requires going beyond rigorous research. It also requires that researchers communicate relevant findings in an understandable way and engage in current debates. In fact, there is an increasing demand for research that can demonstrate measurable societal value and impact. For example, this is increasingly expected in the evaluation of research by funding agencies (Davison and Bjørn-Andersen 2019; Lindgreen et al. 2021). Funding agencies are paying more attention to ensuring that research results in measurable impact for non-academic stakeholders in industry, government, and society at large. To achieve this, we need to look beyond corporate boundaries and understand how digitalization is impacting our society in multiple ways. This, in turn, is facilitated if we as a discipline have a wide view of issues around digitalization.

5 Managing Information Systems in an Age of Uncertainty

Manuel Wiesche

It is essential to revisit the discussion on what is at the heart of our Wirtschaftsinformatik discipline. First, socio-technical information systems, the very subject of our discipline, are continuously evolving, thereby providing new technologies and organizational phenomena to study. Second, our field is growing, luckily with diversity in topics, methods, and perspectives. However, this development creates fuzzy boundaries and the need to continue to revisit the core. Most importantly, with the increasing digitalization in organizations and society, IS research needs to deal with the growing complexity and with the fact that information systems are increasingly nested in all areas of our lives.

With digitalization becoming a buzzword, research similar to Wirtschaftsinformatik work has found broader attention in business schools (Weißenberger and Schäfer 2021). Wirtschaftsinformatik research offers two unique

characteristics that help us stay relevant in academia and practice: the socio-technical nature and its engineering orientation.

Socio-technical information systems comprise human and technical subsystems, thereby combining paradigms of human behavior in organizations with technical system design. This interdisciplinary nature is a primary strength of our discipline. Interdisciplinary research is more successful, measured by scientific success (Larivière et al. 2015), and most likely also better suited to engage with practice. Practitioners are less bound to the artificial boundaries of disciplines and face complex puzzles in their work that require the combination of different perspectives to be resolved. With our interdisciplinary mindset, we should be well equipped to solve the grand challenges of today's society.

When viewing this discussion's theme in the light of the interdisciplinary nature of our discipline, the question arises on which level of granularity this interdisciplinary nature manifests itself. An interdisciplinary research program may involve several related research projects that examine smaller parts of the program. These projects address individual research questions in depth and fit into our publication formats. While the research program itself is interdisciplinary, individual research projects might not be. Our scientific training taught us to reduce large and complex problems into smaller ones. Developing a cumulative body of scientific knowledge and informing practice requires overcoming this fragmentation.

Engineering orientation, the second characteristic, is evident in the plethora of IS studies where design is a central component of the research project. IS research that focuses on design improves system development, enhances decision making, supports conceptual modeling, develops and assesses business models, enhances information markets, and many other domains of Wirtschaftsinformatik research. Design science research seeks to create and evaluate IT artifacts that solve novel and important business problems (Peffers et al. 2007). Therefore, such research is assessed for utility, quality, and usefulness (Venable et al. 2016).

With increasing digitalization, information systems gain in complexity. Globally distributed enterprise systems, nested infrastructure, platform-based business models, or algorithmic decision-making increase the degree of nesting of and dependencies between human and technical systems. This complexity becomes evident in design science studies as well. Coping with complexity has been primarily addressed in the evaluation phase of design science research (Venable et al. 2016).

Complexity, however, is also evident in the earlier phases of design projects. Socio-technical information systems include a plethora of social actors with different preferences and behavior and fast developments in technical systems for storing, processing, and representing information. The entanglement of the social and the technical and nested information systems cause complexity, which results in high levels of uncertainty for information systems designers.

Software development methodologies account for uncertainty by following an agile, iterative approach. Small increments ensure early user feedback in situations with high degrees of uncertainty. The product owner is an important actor in this process, collecting, prioritizing, and refining requirements and evaluating the solution (Maruping and Matook 2020). Other approaches address uncertainty by iteratively linking phases of building, intervening, and evaluating IT artifacts (Sein et al. 2011).

Designing information systems in uncertain environments requires increased attention in the initial phases of problem identification, objective definition, and initial design. We need to continue enhancing our tools and methods to leverage the vast amount of data available for designing novel artifacts. Computational theory development offers promising ideas such as lexical frames to develop explanations for complex phenomena well-grounded in data (Berente et al. 2019). How can design science methods guide process mining, the evaluation of trace data, or the analysis of other large data sources to inform system design? Action design research has developed the principle of guided emergence (Sein et al. 2011). Following this principle, designers enrich the ex-ante design with use experiences provided by users within and outside the organization. Developing methods that include intended as well as unintended user behavior such as workarounds will help design IT artifacts for complex business environments (Röder et al. 2015). Lastly, information system designers can cope with uncertainty in solution development by using user-centered ideation methods such as design thinking (Wiesche et al. 2018). Design thinking offers a problem-centric, tangible, and multidisciplinary approach to ideation that may serve as the basis for more useful IT artifacts in a world where power in IT continues to shift to the users.

If our Wirtschaftsinformatik community continues to strengthen its interdisciplinary and engineering orientation, it will continue to enhance its practical relevance. Our discipline has a tradition of a strong relationship with practice in many ways. For example, many of us engage with practitioners as speakers at practitioner events or conduct joint interdisciplinary research projects with partners from practice and academia alike. We identify enduring problems in practice that inform our academic research agenda, particularly for abductive empirical and design research. In design science research, practitioners

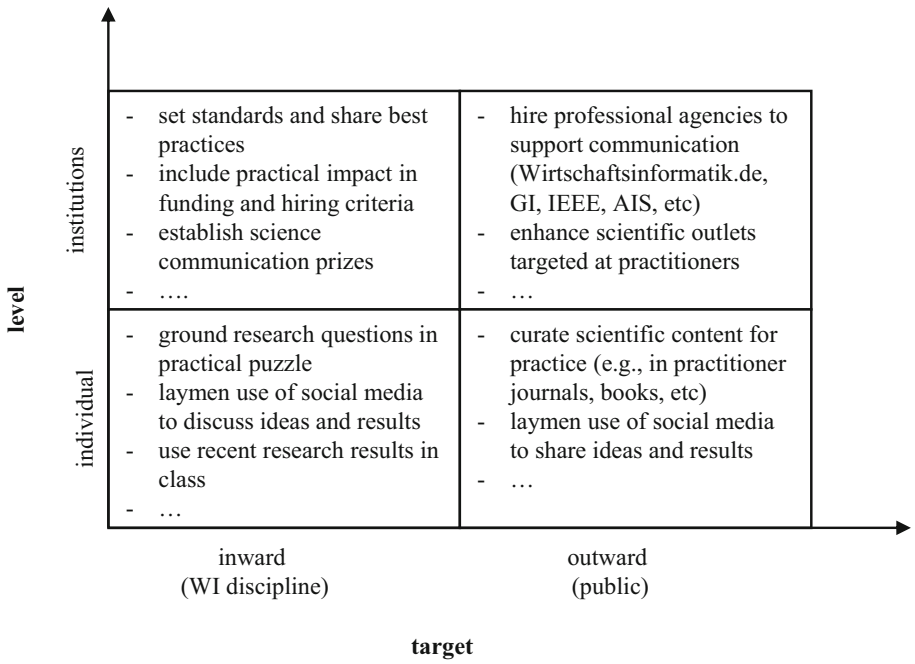

Fig. 1 Engaging with practice in the age of digitalization

even actively participate in the problem-solving or evaluation process.

While there are many different forms of engagement with practitioners, our top scientific journals, including BISE, are most likely not on this list. And I have to admit, I can hardly imagine top IT executives working through long background sections, many subtle methodological details, and implications for other researchers that took many years in the review process. In a large, mature discipline, our scientific journals might not be the right place to inform practitioners. We need the lengthy details and well-considered scientific dialogue to ensure the depth and rigor required to advance our cumulative scientific knowledge. The abductive discovery of anomalies builds on this knowledge and leads to new paradigms that cause revolutions in science (Kuhn 2012).

But how can our cumulative knowledge inform practice? We know from journalism that research needs to (1) be important, (2) have a surprising element, and be (3) capable of attracting readers (Badenschier and Wormer 2012). Secondary factors include being up-to-date and reduced intellectual barriers. Our practice-oriented outlets (e. g., HMD Praxis der Wirtschaftsinformatik, Wirtschaftsinformatik & Management, or MISQ Executive) have evolved into outlets that do well in seeking relevant topics, presenting research results. However, we could better communicate between IS research, practitioners, the public, and media in general.

Addressing a different audience requires adaptation in form, style, and medium. In the time of digitalization, communicating IS research to practice can take many different forms at the individual and the institutional level. Examples include practitioner-oriented books that solve a class of problems for practice, blogs, podcasts, or other social media engagements. Students can conclude cumulative Ph.D. theses with practitioner publications translating scientific ideas into hands-on advice for practice. More senior scientists can use their advanced knowledge to provide politics with information on dealing with digitalization (see Fig. 1 for some further illustrations).

Our community did a great job adapting quality criteria for excellence in research from references disciplines. However, we could improve our criteria for measuring practical relevance or impact, particularly for young scholars. Alternative metrics using social media, news coverage, article downloads, patents, start-ups, and industry talks are most effective in later stages of academic careers after mastery of one or more research topics. Eventually, we need to consider how we motivate ourselves to engage with practice. Directly incentivizing individual outreach will affect the selection of research topics and increase scientific misconduct (acatech 2014). So we might need to find novel ways that honor achievements in a retrospective manner.

Coping with increasing uncertainty in Wirtschaftsinformatik research requires a thorough understanding of the underlying practical puzzle, a way to untangle larger practical problems into smaller projects and finding ways of putting these back together. Following the abductive logic of identifying and explaining a surprising observation should be followed by designing a solution that should then inform practice in problem-solving (Van de Ven 2007). In

an age of digitalization, the public is confronted with IS phenomena in every aspect of life, so people should be interested in our work. We need to continue to develop T-shaped research profiles that help tackle the problem from its many perspectives and find novel ways to translate research results and make them available for practice.

6 Quo Vadis Information Systems Research in Times of Digitalization—Insights from Corporate Practice

Gérard Richter

The increasing and accelerating influence of digitalization in all areas of life—companies, public institutions, and private households—is creating comprehensive changes and increased uncertainty for all parties involved while reinforcing the insight that digitalization creates added socioeconomic value. This added value primarily emerges from the interplay between individuals, organizations, and technology, as well as the understanding and appropriate interpretation of data. In industry practices, however, it is becoming evident that complex problems must often be addressed, and organizational and cultural barriers need to be overcome to leverage the quantitative and qualitative potential of digitalization. The problems to be considered and analyzed call for an interdisciplinary approach from industries like engineering, business administration, business informatics, and computer science. This only seems feasible if new ways of working are implemented that liberate themselves from the old silo mentality, thus enabling exchange and cross-fertilization between disciplines. The basis for the different solutions is provided by an in-depth understanding of (technical) artifacts and causal relationships.

Numerous examples from practice—like the simulation of supply-chain disruptions and their impact on procurement, production, logistics, and sales, or the rapidly changing customer expectations of products and services in different industries and their impact on product development, design, functionality, and suitable distribution channels—also show that the "objects of inquiry" require interdisciplinary consideration and explanation. This can only be accomplished if the relevant expertise from specialized subject-matter domains—namely, research and development, procurement, production, logistics, and sales—and IT can jointly generate ideas and find solutions. Technically pronounced domain competence and domain-pronounced IT competence both have a positive influence on the effectiveness and efficiency of finding solutions, implementing them, and achieving better results.

Furthermore, a discussion around digitalization inevitably leads to a discussion about its economic efficiency. This is coming under increasing pressure due to, among other things, the growing shortage of IT talent alongside the desire to exploit growth opportunities offered by digitalization. Thus, Germany's demand for tech talent exceeds the supply many times over; according to the Stifterverband für die Deutsche Wissenschaft and McKinsey, there will be a shortage of 780,000 experts in 2026 alone. One solution to closing the "talent gap" is closer cooperation with universities and other educational institutions. While this solution is increasingly being postulated, for it to be successful, CIOs, CEOs, and CHROs must define the gaps in the organization's knowledge pool, identify which talent and skills can become future drivers for innovation, and understand what can be regulated through training or restructuring. The goal must be an individual roadmap for the purposeful development of technological capabilities and IT competencies, measured against current and future products or services and the existing technology infrastructure. Business Informatics could play an essential role in the sustained development of IT talent due to its pronounced interdisciplinarity in operational problems. However, this requires an adequate understanding of an interdisciplinary object of inquiry and the research content.

The theses put forward by Schütte and Ahlemann on the object of knowledge and the required relevance of research for real complex problems are supported by operational practice. In their Thesis 1, "The object of inquiry of business informatics should emphasize an economically motivated interdisciplinarity more strongly: Its problems have three components: technology, (social) organization, economics," the authors address a major problem area in planning, implementing, and establishing digital transformations in companies and public institutions. For the economically purposeful deployment of digitalization, it is first necessary to clarify how the use of the IT artifacts by individuals, groups, or organizations affects its impact and what monetary and nonmonetary added value it creates. The overall assessment of this added value is often very complicated in practice, especially because the cause-effect interdependencies between the individual artifacts and influencing factors cannot be determined conclusively. Explaining these interrelationships between technology, organization, and economics in greater depth through Business Information Systems will raise the value potential of digitalization.

In thesis 2, "For practically relevant science by circumventing relevance problems and preventing the problem of model platonism," the authors address a central obstacle to implementing digital initiatives. Business Information Systems and domain architectures that have evolved over decades have led to correspondingly complex IT architectures that are often monolithic and static because of low maintainability. The calls for short implementation cycles and a corresponding short-term realization of the

effects of digitalization on day-to-day operations are opposed by the lengthy change processes in the domains and IT architectures. Furthermore, the isolated consideration of individual digital levers, such as the automation of single business processes or the use of AI systems, while disregarding cause-and-effect relationships in the overall organizational context across the various value chain stages is too short-sighted for practical impact. Such isolated consideration can also lead to digital initiatives that stagnate as ideas or minimal viable products without achieving their full impact in daily operations. This frequently mentioned "scaling problem" should be researched within the broader scope of an interdisciplinary scientific approach. Business Informatics can develop this as a unique selling point among scientific disciplines and contribute to science and practice.

In summary, the theses put forward by the authors on Business Information Systems and the discipline's research for industry practice represent a reasonable and future-oriented focus for companies and public institutions to leverage the potential of digitalization more effectively and efficiently and close the talent gap in this interdisciplinary subject area.

Funding Open Access funding enabled and organized by Projekt DEAL.

References

Abbott A (2001) Chaos of disciplines. University of Chicago Press, Chicago

acatech (2014) On designing communication, between the scientific community the public and the media. https://www.acatech.de/publikation/zur-gestaltung-der-kommunikation-zwischen-wissenschaft-oeffentlichkeit-und-den-medien-empfehlungen-vor-dem-hintergrund-aktueller-entwicklungen/. Accessed 24 May 2022

Agarwal R, Lucas HC (2005) The information systems identity crisis: focusing on high-visibility and high-impact research. MIS Q 29(3):381–398

Ahlemann F, Schütte R, Stieglitz S (2021) Preface. In: Innovation through information systems, vol I: A collection of latest research on domain issues. Springer, Wiesbaden, pp V-XIII

Akhlaghpour S, Wu J, Lapointe L, Pinsonneault A (2013) The ongoing quest for the IT artifact: looking back, moving forward. J Inf Technol 28(2):150–166

Albert H (1963) Modell-Platonismus: der neoklassiche Stil des ökonomischen Denkens in kritischer Beleuchtung. In: Karrenberg F, Albert H (eds) Sozialwissenschaft und Gesellschaftsgestaltung. Festschrift für Gerhard Weißer. Duncker & Humblot, Berlin, pp 45–78

Albert H (1967) Probleme der Wissenschaftslehre in der Sozialforschung. In: König R (ed) Handbuch der empirischen Sozialforschung, vol1, 3rd edn. dtv, Stuttgart, pp 57–102

Albert H (1991) Traktat über kritische Vernunft. Mohr Siebeck, Tübingen

Albert H (1998) Marktsoziologie und Entscheidungslogik. Zur Kritik an der reinen Ökonomik. Mohr Siebeck, Tübingen

Badenschier F, Wormer H (2012) Issue selection in science journalism: towards a special theory of news values for science news? In: Rödder S et al (eds) The sciences' media connection—public communication and its repercussions. Springer, Heidelberg, pp 59–85

Becker J, vom Brocke J, Heddier M, Seidel S (2015) In search of information systems (grand) challenges—a community of inquirers perspective. Bus Inf Syst Eng 57(6):377–390

Benbasat I, Zmud RW (1999) Empirical research in information systems: the practice of relevance. MIS Q 23(1):3–16

Benbasat I, Zmud RW (2003) The identity crisis within the IS discipline: defining and communicating the discipline's core properties. MIS Q 27(2):183–194

Berente N, Seidel S, Safadi H (2019) Research commentary—data-driven computationally intensive theory development. Inf Syst Res 30(1):50–64

Bichler M, Frank U, Avison D, Malaurent J, Fettke P, Hovorka D, Krämer I, Schnurr D, Mueller B, Suhl L, Thalheim B (2016) Theories in business and information systems engineering. Bus Inf Syst Eng 58(4):291–319

Coy W (2001) Was ist Informatik. Zur Entstehung des Fachs an deutschen Universitäten. In: Desel J (ed) Das ist Informatik. Springer, Heidelberg, pp 1–22

Davenport TH, Markus ML (1999) Rigor vs. relevance revisited: response to Benbasat and Zmud. MIS Q 23(1):19–23

Davison RM, Bjørn-Andersen N (2019) Do we care about the societal impact of our research? The tyranny of the h-index and new value-oriented research directions. Inf Syst J 29(5):989–993

DeSanctis G (2003) The social life of information systems research: a response to Benbasat and Zmud's call for returning to the IT artifact. J Assoc Inf Syst 4(7):360–376

Desouza KC, El Sawy OA, Galliers RD, Loebbecke C, Watson RT (2006) Beyond rigor and relevance towards responsibility and reverberation: information systems research that matters. Commun Assoc Inf Syst 17(1):341–353

Galliers RD (2003) Change as crisis or growth? Toward a trans-disciplinary view of information systems as a field of study: a response to Benbasat and Zmud's call for returning to the IT artifact. J Assoc Inf Syst 4(1):337–351

Gregor S (2006) The nature of theory in information systems. MIS Q 30(3):611–642

Hammer M, Champy J (1993) Reengineering the corporation—a manifesto for business revolution. HarperCollins, New York

Hassan NR (2021)Is not capable of coming up with native theories" says its senior scholar. AISWorld Mailing List. https://lists.aisnet.org/pipermail/aisworld_lists.aisnet.org/20211212/thread.html. Accessed 24 May 2022

Heinrich LJ (2011) Geschichte der Wirtschaftsinformatik. Entstehung und Entwicklung einer Wissenschaftsdisziplin. Springer, Heidelberg

Heinrich LJ, Heinzl A, Riedl R (2011) Einführung in die Wirtschaftsinformatik. Einführung und Grundlegung. Springer, Heidelberg

Kapeller J, Ferschli B (2019) Hans Albert und die Kritik am Modell-Platonismus in den Wirtschaftswissenschaften. In: Franco G (ed) Handbuch Karl Popper. Springer, Wiesbaden, pp 733–749

Kuhn TS (2012) The structure of scientific revolutions. University of Chicago Press, Chicago

Larivière V, Haustein S, Börner K (2015) Long-distance interdisciplinarity leads to higher scientific impact. PLoS ONE 10(3):e0122565

Lee AS, Hubona GS (2009) A scientific basis for rigor in information systems research. MIS Q 33(2):237–262

Legner C, Eymann T, Hess T et al (2017) Digitalization: opportunity and challenge for the business and information systems engineering community. Bus Inf Syst Eng 59(4):301–308

Lindgreen A, Di Benedetto CA, Clarke AH, Evald MR, Bjørn-Andersen N, Lambert DM (2021) How to define, identify, and measure societal value. Ind Mark Manag 97:A1–A13

Malik F (2013) Management: Das A und O des Handwerks, 2nd edn. Campus, Frankfurt

Maruping L, Matook S (2020) The multiplex nature of the customer representative role in agile information systems development. MIS Q 44(3):1411–1437

Österle H, Becker J, Frank U, Hess T, Karagiannis D, Krcmar H, Loos P, Mertens P, Oberweis A, Sinz EJ (2010) Memorandum zur gestaltungsorientierten Wirtschaftsinformatik. Zfbf 62(6):664–679

Peffers K, Tuunanen T, Rothenberger MA, Chatterjee S (2007) A design science research methodology for information systems research. J Manag Inf Syst 24(3):45–77

Recker J (2021) Scientific research in information science. Progress in IS, 2nd edn. Springer, Heidelberg

Robey D (2003) Identity, legitimacy and the dominant research paradigm: an alternative prescription for the IS discipline: a response to Benbasat and Zmud's call for returning to the IT artifact. J Assoc Inf Syst 4(1):352–359

Röder N, Wiesche M, Schermann M, Krcmar H (2015) Workaround aware business process modeling. In: Proceedings Wirtschaftsinformatik, Osnabrück. https://aisel.aisnet.org/wi2015/33

Sarker S, Chatterjee S, Xiao X, Elbanna A (2019) The sociotechnical axis of cohesion for the IS discipline: its historical legacy and its continued relevance. MIS Q 43(3):695–720

Scheer AW (1992) Architektur integrierter Informationssysteme. Springer, Heidelberg

Sein MK, Henfridsson O, Purao S, Rossi M, Lindgren R (2011) Action design research. MIS Q 35(1):37–56

Sidorova A, Evangelopoulos N, Valacich JS, Ramakrishnan T (2008) Uncovering the intellectual core of the information systems discipline. MIS Q 32(3):467–482

Straub D, Ang S (2011) Rigor and relevance in IS research: redefining the debate and a call for future research. MIS Q 35(1):iii–xi

Van de Ven AH (2007) Engaged scholarship: a guide for organizational and social research. Oxford University Press on Demand

Venable J, Pries-Heje J, Baskerville R (2016) FEDS: a framework for evaluation in design science research. Eur J Inf Syst 25(1):77–89

vom Brocke J, van der Aalst W, Grisold T, Kremser W; Mendling J, Pentland B, Recker J, Roeglinger M, Rosemann M, Weber B (2021) Process science: the interdisciplinary study of continuous change. Working Paper. https://ssrn.com/abstract=3916817 or http://dx.doi.org/https://doi.org/10.2139/ssrn.3916817

Walsham G (2012) Are we making a better world with ICTs? Reflections on a future agenda for the IS field. J Inf Technol 27(2):87–93

Weber R (2006) Like ships passing in the night: the debate on the core of the information systems discipline. Information systems: the state of the field. Wiley, Chichester, pp 292–299

Weber R (2011) The information systems discipline: the need for and nature of a foundational core. Inf Syst 1–12

Weißenberger B, Schäfer U (2021) Die BWL braucht neue Inhalte. Frankfurter Allgemeine Zeitung, 30 June 2021

Wiesche M, Leifer L, Uebernickel F, Lang M, Byler E, Feldmann N, Garcia-Cifuentes JP, Höltää-Otto K, Kelly K, Satzger G (2018) Teaching innovation in interdisciplinary environments: toward a design thinking syllabus. In: AIS SIGED International Conference on Information Systems Education and Research, San Francisco

Zelewski S (1999) Grundlagen. In: Corsten H, Reiß M (eds) Betriebswirtschaftslehre, 3rd edn. Oldenbourg, München, pp 1–125