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DICUSSION

Riding the Digitalization Wave: Toward a Sustainable Nomenclature in Wirtschaftsinformatik

A Comment on Riedl et al. (2017)

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1 Digitalization: Just Another Fad?

From a sociotechnical perspective and detached from its original meaning in engineering, digitalization is often broadly defined as the multi-level changes – on the individual, organizational, and societal levels – resulting from the introduction of new information technologies (e.g., Götter 2016; Hess 2016; Legner et al. 2017). While such technology-driven changes have been at the core of the Wirtschaftsinformatik (WI) discipline for decades, it has been argued that the current digitalization wave is different as it "transforms almost every aspect of our private and professional environment" (Legner et al. 2017, p. 302). It is in this context that Riedl et al. (2017) discuss the relationship between digitalization and information management (IM) and note "it is hoped that this discussion will instigate further discourse" (p. 475). We would like to use this as an opportunity to comment on some of the arguments and ideas put forward in Riedl et al. (2017), as well as to contribute to the broader discussion on the topic of digitalization within the WI discipline (e.g., Legner et al. 2017).

Each individual contribution in Riedl. et al. (2017) includes arguments that deserve closer attention and more thought. The majority of the discussants seem to assume that the current digitalization wave is neither a fad nor represents a natural evolution of existing concepts. However, some discussants also express their doubts and concerns. For example, René Riedl states, "it is possible that a look back at 2017 in 5 or 10 years will reveal that digitalization was just another fad" (p. 476). Relatedly, Dirk Stelzer concludes "digitalization is not a new topic for BISE or IM. The current emphasis on digitalization rather indicates that it is a fad." (p. 480). In this regard, the 'force' with which the current digitalization wave arrived around 2014 (see Fig. 1), along with the abundance of newly coined 'digital' terms, can be seen as indicators of digitalization being "just another fad." For example, over the last years, one of the authors of this article has collected neologisms that include the word 'digital.' As of April 2018, this resulted in a list of more than 2700 terms from "Abenteuer Digitalisierung" to "Zwangsdigitalist" (cf. Mertens and Barbian 2016; Mertens et al. 2017).

Clearly, as highlighted by some of the discussants in Riedl et al. (2017), the current digitalization wave is creating manifold opportunities for the WI community, including a potential increase in the discipline's visibility (cf. Legner et al. 2017). However, the digitalization wave, we argue, also brings along some major drawbacks that require careful attention by the community.

First, current WI research appears to have a tendency toward treating digitalization as an entirely new phenomenon, which bears the risk of 'reinventing the wheel.' This tendency can prevent cumulative research and knowledge generation, thereby impeding academic progress within the WI discipline as a whole (cf. Riedl et al. 2017).

Second, the digitalization wave may lead to a waste of resources in research and practice in the upswing phase, as

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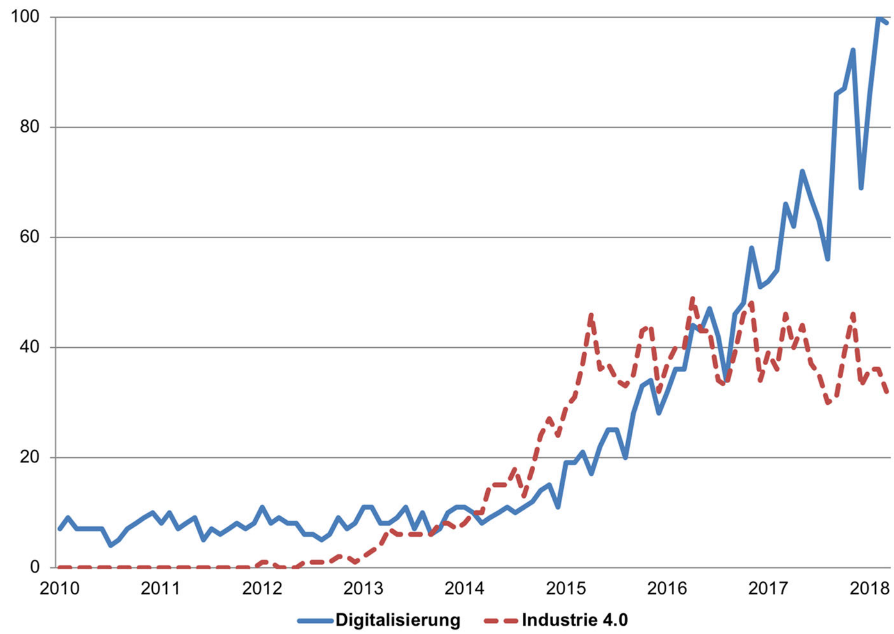
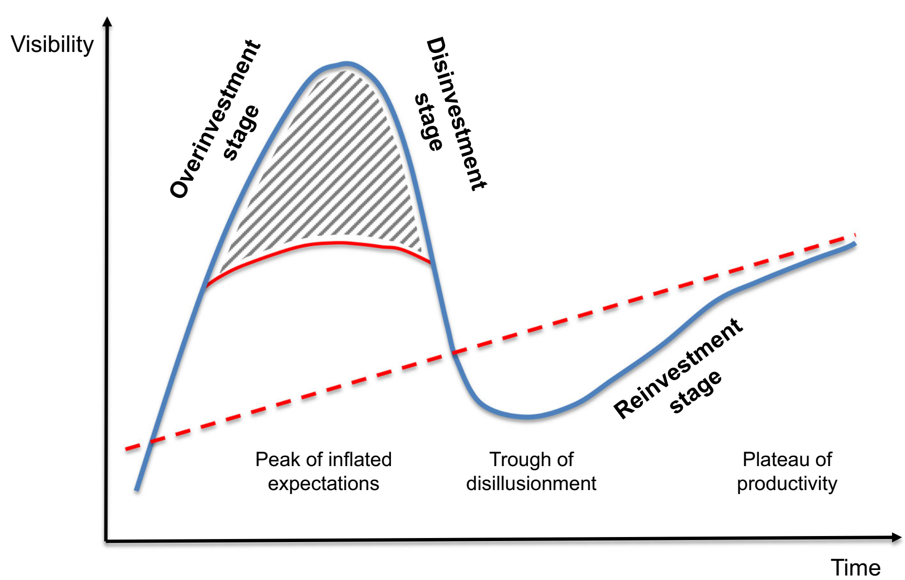
Fig. 1 Google Trends Index: "Digitalisierung" and "Industrie 4.0". Google Trends indexes their data to 100, where 100 reflects the maximum search interest for the time period (January 2010–March 2018) and location (Germany) selected



well as to overreactions right up to panic in the downswing phase. As indicated in Fig. 2, it would thus be preferable to avoid climbing the "peak of inflated expectations" (i.e., the shaded area) and, ideally, to follow a more moderate and constant development path (i.e., the dashed line; von Bomhard 2016; cf. Mertens et al. 2017). For example, in a recent *Harvard Business Review* article, Davenport and Westerman (2018) present numerous examples of high-profile firms – such as Ford, General Electric, Lego, Nike, and Procter & Gamble – that "spent millions to develop digital products, infrastructures, and brand accompaniments, and got tremendous media and investor attention, only to encounter significant performance challenges, and often shareholder dissent." Consequently, some firms considerably downsized their digital units (e.g., Nike); others asked the CEO that led the digital transformation to leave (e.g., General Electric) or to step into 'lesser' roles (e.g., Lego). A key lesson Davenport and Westerman (2018) derive from their study of failed digital transformations is that no manager "should view digital – or any other major technological innovation – as their sure salvation." On a related note, Timotheus Höttges, CEO of Deutsche Telekom, stated repeatedly that Germany has overslept the digital revolution and that "Europe [in general] has already lost the first half" (e.g., Sauerbrey 2014). However, more recently, he also admitted that the 'bread-

Fig. 2 Investment stages along the Gartner Hype Cycle



and-butter' IT systems of Deutsche Telekom are insufficient, and consequently announced a change in corporate strategy (e.g., Berke 2018).

Third and relatedly, hyping digitalization may upset companies and their managers. For example, existing studies suggest that the German Mittelstand – often referred to as the 'powerhouse' of the German economy – responds with restraint, if not resistance, to the adoption of Industry 4.0 technologies (Kleemann and Becker 2018). A common finding of these studies is that the conceptual confusion and perceived hype around the topic of Industry 4.0 restrain companies from engaging themselves in this topic; after all, they were able to postpone, or ignore, other hypes in the past (ibid).

Given the above, we would also like to caution against an overly simplistic and pragmatic view of the current digitalization wave and its implications for the WI discipline. In the end, such a view may even contribute to further intensifying the above-mentioned risks, e.g., by pretending digitalization is something fundamentally new and by requesting additional resources from government entities and other funding agencies (which inevitably cannot have expert knowledge in all related areas). For example, Alexander Benlian makes the point that digitalization and digital transformation (DT) "are fundamental and long-lasting research topics that have been incorporated into the agendas of many funding organizations worldwide today (e.g., BMBF, NSF). […] Given these developments, establishing DT as a distinct research field would help BISE scholars target such research programs more forcefully […] and send an important signal to rival disciplines (e.g., computer science, mechanical engineering) vying for the same funding sources" (Riedl et al. 2017, p. 477; also Legner et al. 2017). According to this logic, one could also argue that politicians – who presently tend to equate digitalization with e-government, network infrastructure, as well as artificial intelligence (cf. Kluth 2018) – have occupied the digitalization term and that, for opportunistic reasons, WI scholars should adjust their understanding of this term accordingly. In this context, scholars might face a difficult trade-off in terms of how to ride the current digitalization wave: on the one hand, they find themselves in fierce competition with other scholars and research institutions for external funding; on the other hand, they are mindful of their academic responsibility, also referred to as "upright academic walking" – a phrase that has been repeatedly used by Jan Marco Leimeister. Against this backdrop, we argue that WI as a gradually maturing academic discipline needs to strive for developing a sustainable nomenclature of digitalization-related terms and concepts, thereby tackling the problems outlined below.

2 The Translation and Definition Problems

The English language offers the distinction between *digitization* (i.e., the technical process of converting analog signals into digital/binary signals for the purpose of data processing) and *digitalization* (i.e., the sociotechnical changes resulting from the adoption of digital technologies) (cf. Legner et al. 2017). Still, there is currently some confusion around the term digitalization. For example, in November 2017, Jeanne Ross, principal research scientist at *MIT's Center for Information Systems Research*, published a column in *Sloan Management Review* with the telling title: "Don't confuse digital with digitization" (Ross 2017). To make things worse, in German, both digitization and digitalization are translated with *Digitalisierung* (Kluth 2018). Therefore, the ambiguous meaning of *Digitalisierung* can, at least in parts, be ascribed to the uncritical translation and adoption of English terms that sound attractive but differ in meaning (ibid). Other examples include *technology*, which often refers to *Technik* rather than *Technologie* in German; *enterprise resource planning* (*ERP*), which has relatively little to do with the actual planning of enterprise resources; *collaboration*, which refers to traitorous cooperation in German; as well as *industry*, which has a narrower meaning in German than in English.

Adding to this, the original meaning of *Digitalisierung* (in terms of digitization) has been clearly defined in electrical engineering and computer science – two well-established and recognized academic disciplines. Here, one may be of different opinions whether other disciplines, including WI, should be allowed to broaden the precise definition of this term to a much more comprehensive understanding (i.e., digitalization). For example, what would accountants say if engineers equated "accounting" with "general management"? On a side note, predictions suggest that, once the scientific and economic limits of Moore's Law will have been passed, further progress in computer technology may come from partly replacing physical phenomena with biological and chemical ones, such as in quantum computing. If this were the case, the word component "digit" would become even more questionable than it already is.

A related problem concerns the myriads of definitions on the sociotechnical interpretation of *Digitalisierung* that are currently circulating (cf. Mertens et al. 2017). For example, consider some of the definitions that are used by the discussants in Riedl et al. (2017): René Riedl defines digitalization as "the process of introducing digital technologies, which essentially deal with changes caused by information technologies" (p. 475). Alexander Benlian seems to equate digitalization with digital transformation (DT). He highlights that "DT covers units and levels of analysis that partially differ or go beyond those typically examined in IM research" and that "DT research typically places strong emphasis on the customer interface and on how information and communication technologies (ICTs) affect business concepts such as processes, services, and products" (p. 477). Dirk Stelzer refers to digitalization and digital transformation as "related concepts" (p. 479) and conceptualizes them in terms of five topic areas (business activities, products/services, business models, business/IT strategies, and transformation processes). Hermann Sikora describes digitalization as "the process, which leads society from the postindustrial information society into all aspects of the 'digital society' ('digitality')" (p. 481). Further, he points out that digital transformation "primarily deals with the managerial-technical viewpoint of business model transformation" (p. 481).

3 The Sustainability Problem

Another problem relates to the broader, and somewhat rhetorical, question whether it favors the development of an academic discipline when new names and concepts are added at short intervals without an explanation of the 'scientific delta' (i.e., how they differ from existing ones) and the expected advantages of adopting them. This question becomes even more important when new terms are not conceptually distinct and/or not semantically fitting. For example, the term Industry 4.0 was well founded, at least with regard to the historical progression from pure mechanics to electricity through to cyber-physical systems. Unfortunately, by now, the meaning of Industry 4.0 is so ambiguous that many different concepts can be subsumed under this umbrella term (Mertens et al. 2017). Among other things, this can be traced back to 'aggressive' marketing campaigns by hardware/software vendors and IT consulting firms that shaped politicians, journalists, and lobbyists' understanding of what Industry 4.0 is all about. In this context, we find Dirk Stelzer's approach to compare different versions of the WI curriculum framework (*Rahmenempfehlung für die WI-Ausbildung an Hochschulen*) to be thought-provoking, as it plausibly demonstrates the discontinuous development of focal research and teaching areas (and related terminology) within the discipline.

Of course, the above discussion is based on a very limited number of observations. But we believe it symptomizes what is going on in the WI discipline on a larger scale. In this context, we find the following statement by Hermann Sikora – the only discussant in Riedl et al. (2017) who is working in corporate practice – to be particularly important: "The practical relevance of [WI] however does not absolve [IM] from maintaining a consistent set of terms, definitions and concepts, independent of how radical and wide reaching actual IT developments might be" (p. 481). And, in our opinion, the same should apply to digitalization as a socio-technical phenomenon. This implies that a key task for the members of the WI community is yet to develop, and agree on, a sustainable nomenclature that governs the consistent use of digitalization-related terms, as well as ensures their semantic fit (e.g., with respect to their original meaning in German).

4 The Novelty Problem

One of the discussants in Riedl et al. (2017), Alexander Benlian, makes the point that "pigeonholing powerful new phenomena in old categories bears the risk that these old categories become bloated and shapeless, and that scientific progress eventually stalls" (p. 478). Further, he points out that „all scientific disciplines have to evolve over time to make scientific progress and build cumulative knowledge" (p. 478). We fully agree with the latter and, as noted above, argue that 'selling' digitalization phenomena as something entirely new creates the risk that current research fails to build on the existing body of knowledge, which in turn hinders academic progress in the WI discipline. For example, browsing the proceedings of more recent WI conferences (*MKWI* and *WI*), an author of this article noticed that doctoral students working on Industry 4.0-related topics were not aware of the fact that, back in the 1980s, *Volkswagen* (*VW*) had conducted a large-scale automation project/experiment, called *Halle 54*. As a consequence, they were also not aware that the *Halle 54* project failed to meet some of its objectives; that unintended side effects of technical and socio-emotional nature emerged (e.g., staff members did not want to be 'flunkies' of machines); and that scientific studies on this project are documented in the literature (cf. Heßler 2014). In other words, the doctoral students' research did not build on existing research results. If students then also limited their literature search to the more recent past – based on the argument that "there was no such thing as Industry 4.0 before 2010" (e.g., Howaldt et al. 2015) – it becomes even less surprising that they missed relevant concepts and studies. In essence, the same problem occurs if researchers and/or their supervisor(s) do not recognize that cyber-physical systems – an integral feature of Industry 4.0 according to Kagermann et al.'s (2013) original definition – are closely related to multi-agent systems for production planning and control. The latter have been studied extensively in the 1990s (e.g., Weigelt 1994; see also Berndt 2015). For example, already back then, researchers examined under what circumstances and in consideration of conflicting goals (e.g., short throughput time vs. low capital lockup), a manufacturing company should choose decentralized production scheduling with multi-agent systems (i.e., cyber-physical systems) over centralized approaches. On a related note, in multiple waves, the critical role of IT as a strategic 'weapon' for achieving competitive advantage has been discussed repeatedly in the academic and practitioner literatures since the late 1980s (e.g., Plattfaut 1988). The above-exemplified problem is nicely summarized by Christine Legner and Torsten Eymann (Legner et al. 2017): "As a discipline, we have been studying the exploitation and uses of digital technologies for decades – from early mainframe computers to client server systems and, more recently, the Internet and Web 2.0. Digitalization can be considered as the common denominator of our discipline, rather than a completely new phenomenon" (p. 302).

In our opinion, the central question is therefore what is really new about digitalization, and what is only 'old wine in new bottles' (cf. Friedman 1991). In this regard, Riedl et al. (2017) article triggers an important discussion on the overlaps between digitalization and a well-established topic area, IM. Here, we concur with Thomas Hess' argument that many traditional IM tasks are closely linked to digitalization aspects. Also, undoubtedly, innovative automation and/or artificial intelligence (AI) projects pose new challenges and tend to be riskier than traditional IT projects. Examples include Google's self-driving car project, or Facebook's recent experiment, where two AI agents invented their own language that humans could no longer understand (Wilson 2017). However, we also think that Hess' approach to demarcate digitalization from IM by distinguishing between operational and strategic tasks – referred to as "Scenario C" in Riedl et al. (2017) – appears to be overly simplistic, as it is often difficult to separate operational application systems from corporate strategy. Consider the following example: Given the availability of new materials and production technologies, a German manufacturer aims to leverage the quality label "Made in Germany" and decides to shift from a low-cost to a high-quality market strategy. Among other things, this strategic shift requires greater precision and less tolerance in production processes – especially when compared to "Made in China" – and necessitates the use of advanced IT-based quality control systems along with sophisticated supply chain and customer relationship management systems. In this example: What is strategy, what is IM, and what is digitalization?

Similarly, Alexander Benlian makes the point that digital transformation "even goes so far as to look at how information is embedded in products and services […] and thus how information can be a core feature of digital products or innovative business models" (p. 477). Here, one could also argue that novel ways of embedding information in products and services are merely a result of advances in IT supporting long-lasting business models. For example, think of well-established service companies that mediate the relationship between suppliers and customers, such as car-sharing and travel agencies, real-estate and freight brokers, headhunters, etc. Also, to characterize the business model of most of these service companies, one may refer to the concept of a 'digital platform.'

5 Concluding Remarks

In conclusion, the panel discussion initiated by René Riedl and colleagues, as well as the corresponding BISE article (Riedl et al. 2017) along with the article by Legner et al. (2017), represent important examples of how the WI discipline can edge its way to a sustainable nomenclature of digitalization-related terms and concepts. In doing so, academic disciplines such as pharmaceutics and pharmacology can serve as role models, as they seem to successfully withstand the temptation of adopting exaggerated buzzwords introduced and promoted by special interest groups. Also, WI could follow the example of other disciplines where the scientific delta of a new concept is assessed before it gets included in the discipline's 'conceptual toolbox' (e.g., when virologists detect that a virus has mutated into two different variants). After all, scientific progress is not achieved by reinventing the wheel and giving it a new name, but through careful and systematic differentiation leading to an improved command of complexity.

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