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Abstract

This paper aims to advance understanding of information systems (IS) through a critical reflection on how IS are currently defined in the IS literature. Using the hermeneutic approach for conducting literature reviews the paper identifies 34 definitions of IS in the literature. Based on the analysis of these 34 definitions four different views of IS are distinguished: a technology view emphasizing the technological aspects of IS; a social view emphasizing the sociocultural aspects; a socio-technical view emphasizing the interconnection of technology and social elements; and a process view emphasizing the activity orientation of IS. The paper critically examines the contributions and limitations of these different approaches for understanding and theorizing IS. Based on this examination the paper argues to for the need to develop an additional, alternative sociomaterial conceptualization of IS based on a non-dualist, relational ontology.

1. Information Systems

Information systems (IS) involve a variety of information technologies (IT) such as computers, software, databases, communication systems, the Internet, mobile devices and much more, to perform specific tasks, interact with and inform various actors in different organizational or social contexts. Of general interest to the field of IS are therefore all aspects of the development, deployment, implementation, use and impact of IS in organizations and society [2; 15; 17; 28; 70]. However, the IS field is not primarily concerned with the technical and computational aspects of IT. What matters to IS instead is how technology is appropriated and instantiated in order to enable the realization of IS that fulfill various actors' – such as individuals, groups or organizations – information needs and requirements in regards to specific goals and practices. While this is widely recognized in the IS community, the term 'information system', which is foundational to the IS field, is rarely explicitly defined and examined, and is typically taken for granted [54]. This lack of conceptual engagement with 'IS' motivated recent calls to the IS community to further its engagement with core concepts that are central to the field and its research [5; 54; 87].

Furthermore, this lack of engagement is problematic as it can lead to fuzzy and unclear use of the concept of IS, and can hinder the formulation of a clear identity for the IS field as well. "Whenever IS researchers and professionals have used the term 'information system,' one could substitute the term 'information technology,' 'computer system,' or simply, 'the computer' where the substitution would often make little or no difference. In retrospect, it is no exaggeration to describe most IS researchers as having used the term 'system' or 'systems' to refer to just about anything that involves electronic information technology" [54, p. 339]. However, such usage of the term is questionable as it blurs the distinction between IT, as one defining notion, and IS as another defining notion of the IS field [e.g. 36; 53; 54]. It also undermines the importance of human, social and organizational aspects of interest to IS [5; 53; 54]. And finally, conceptual advancements regarding 'IS' as a foundational concept for the field are hampered by the lack of conceptual clarity. If researchers are not clear what they mean when they talk about IS, it is difficult to compare research results and build on each other's work leading to cumulative research tradition.

Taking all these concerns together, defining IS is identified as one of the main challenges for the IS field in an editorial by the European Journal of Information Systems: "It could be a surprise that what an IS is is not established. On the other hand, since many people are studying IS from a variety of perspectives, maybe it should be no surprise that there are a variety of definitions. But then, how would Society know what IS is and what it can do if there is no clear understanding?" [73, p. 194]. Definitions of IS are therefore of interest to the IS community as they can help in establishing a common ground for understanding and researching IS, and distinguishing IS as a field of inquiry from other fields. What an IS is and what it entails has important consequences for recognizing IS as a distinct domain of knowledge and for

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understanding how different branches of IS relate to each other and what aspects are of concern to IS researchers [73]. Moreover, the concept of IS is central to the debate about the field's identity and its aims as understanding what an IS is has important implications for what IS researchers should research, what IS educational programs should contain and how they should be differentiated from IT programs or other business programs [27; 43].

Therefore, there is a clear need to further examine what an IS entails. Thus, the key objective of this research is to advance understanding of IS, by critically reflecting on how IS are currently defined in the IS literature. Apart from [1] we are not aware of an attempt to systematically collect and review different definitions of IS. Our aim is therefore to collect and analyze an extensive list of definitions of IS in order to contribute to a better understanding of how IS are defined in the literature, and to critically examine the contributions and limitations of dominant IS conceptions to IS theorizing. To achieve this aim we apply the hermeneutic approach for conducting literature reviews [12].

The following sections will first look at the process of identifying definitions of IS and then introduce these definitions, grouping them into four different views. We then discuss and exemplify the contributions made by different views for understanding IS. Critically reflecting on these views we argue that current definitions are commonly grounded in an ontological position seeing humans and technology inherently separated. Finally we point out that there is a potential for developing an alternative sociomaterial conception of IS.

2. Looking for Definitions of IS

To address the aim of this research, we used the hermeneutic approach for conducting literature reviews in order to identifying relevant literature [12]. According to the hermeneutic approach, as a research project progresses researchers gain a better understanding of the literature relevant to their project. Therefore, the identification of relevant literature is not a straight forward process that can be undertaken at the beginning of a research project relying on strict keyword searches [58]. Instead, while a research project and the review of existing literature progresses additional relevant perspectives can emerge at any time that encourage further engagement with existing literature. In our case, after we assembled a considerable list of IS definitions we continued our engagement with the existing literature by looking for further literature in order to discuss and exemplify the contributions made by different understandings of IS. On the basis of this discussion we decided to further our engagement with the existing literature in order to identify publications relevant to a critical examination of the assumptions underlying different definitions of IS.

Initially we focused on definitions of IS because we wanted to identify explicit statements made in IS that clearly express what IS are. As we were interested in finding definitions of IS literature searches targeted the phrases "information systems are" or "an information system [is]", as these phrases are likely to be used by explicit definitions of IS. We also sought suggestions from other IS researchers regarding additional literature containing definitions of IS, as well as used snowballing for identifying further definitions that were not initially picked up by our search. Using searches definitions were identified through Google and Scopus, a large literature database covering articles published in 21,000 peer-reviewed journals [82]. In addition to database searches we also looked for definitions of IS appearing in IS textbooks. The reason for the inclusion of textbooks is that they play an important role in academic discourse as they form the initial conception about the IS field for novice researchers and future practitioners. Moreover, they are most likely to reflect some understanding that has been agreed upon in the wider IS community: "A good way to find out the conventional wisdom in any field is to see what the introductory university-level student textbooks have to say on the subject. The task of such books is not to draw too much attention to the ambiguities and problems of the field – students will encounter those later – but to provide an account of the field in a straightforward way. Authors of such texts naturally give the account which embodies the more common conceptualisation of the field, the currently conventional view of it" [20, pp. 41-43]. To reflect current understanding and ensure the acceptance of textbooks for IS education we only included definitions from textbooks published in 2008 or more recently and appearing at least in their fourth edition.

As our review progressed and our list of definitions of IS continuously grew we reached a point where additional definitions gradually resembled definitions already included in our review. At this point we had identified definitions coming from a broad range of sources including, journal articles, conference papers, book chapters, monographs and textbooks. Also comparing our list to another listing by [1] we became confident that our review of IS definitions reached a saturation point reflecting the diversity of the range of available definitions. However, as our list included, for instance, definitions of IS from a wide variety of sources, such as definitions

posted on institutional websites [e.g. 92] we decided to select those meeting all of the following three criteria: (i) The definition appears in established scholarly publications including peer reviewed journals, conference proceedings, edited books, textbooks, and monographs; (ii) The definition is an explicit statement about what an IS is rather than an indirect implied understanding; and (iii) The definition is intended for the IS field. As a result a total of 34 definitions were selected.

3. Definitions of IS

Looking at definitions of IS we noticed distinct differences among them. We therefore used thematic analysis [29] for thoroughly analyzing all 34 definitions with regard to each definition's main emphasis. To ensure a common ground for comparison, analysis of definitions was based on each definition as it was originally expressed. While the formation of our understanding of categories was informed by an earlier classification of IS research [68] our analysis is distinct as we were interested in definitions of IS rather than the role of technology.

From this analysis we identified four distinct conceptualizations of IS: a technology view, a social view, a socio-technical view and a process view. These four views are based on the main aspect emphasized by each definition: (a) technological aspects, including the processing, storage and transformation of data; (b) social aspects, emphasizing that IS are intrinsically social systems; (c) socio-technical aspects, arguing that IS include both social and technological components that are interrelated; and (d) process aspects - conceptualizing IS in terms of performing and supporting activities and processes (Table 1). The classification of each definition was undertaken according to its most prevalent emphasis in regards to these four aspects.

Definitions falling under the technology view stress the importance of IT in an organizational context [64; 88; 93] or the software used for the processing, storage and distribution of data and information [51; 65; 67; 72]. Definitions associated with this view do not generally deny the importance of other aspects regarding IS, however, they emphasize the importance of technology, especially IT, in the form of hardware, networks and software over other aspects. In this sense, organizations are seen as a context for IT [e.g. 88].

Definitions taking a social view emphasize the importance of the social nature of IS. Frequently, they also recognize the importance of technology [47; 48; 45] but they generally consider technology to be subordinate to social aspects (Table 1). In contrast to the technology view, which locates agency in technology, the social view puts agency on humans and social systems. Therefore, of key importance are the social institutions and organizations that enable and constrain human agency [18; 60] and the ways in which human actors create, share and interpret information and attribute meanings to IS [37]. This is achieved by communicating and storing signs, which are of potential value to social actors and their actions [8; 9; 89].

Table 1: Overview of Definitions of IS

View	Exemplary Definition
Technology View	"The system utilises computer hardware and software; manual procedures; models for analysis, planning, control and decision making; and a database. The emphasis is on information technology (IT) embedded in organizations" [88, p. 181].
Social View	"an information system is a social system, which has embedded in it information technology. The extent to which information technology plays a part is increasing rapidly. But this does not prevent the overall [information] system from being a social system, and it is not possible to design a robust, effective information system, incorporating significant amounts of the technology without treating it as a social system" [47, p. 215].
Socio-Technical View	"the information systems field examines more than just the technological system, or just the social system, or even the two side by side; in addition, it investigates the phenomena that emerge when the two interact" [52, p. iii].
Process View	"An IS is a work system whose process and activities are devoted to processing information, that is, capturing, transmitting, storing, retrieving, manipulating, and displaying information" [1, p. 451].

The definitions which fall under the socio-technical view describe IS in terms of both social and technical aspects that are in continuous interaction [20; 52]. Importantly IS are not only seen as consisting of technological as well as social components, but as phenomena that emerge when they interact. IS are neither technically determined nor socially determined. Instead technology and social systems interact with each other in a way that makes the resulting IS more than the sum of its parts. To borrow the molecular analogy from [24], an IS is more like a compound than a mixture. This requires IS researchers to simultaneously look at the social and technical as-

pects focusing on the phenomena that emerge when they interact [24; 52; 53; 54]. According to the socio-technical view, IS include formal as well as informal aspects [73; 86] and may consider technology beyond IT, including for instance paper-based systems [35].

The definitions of IS which fall under the process view emphasize that IS are related to the particular information processing activities they perform and support, c.f. [1] in Table 1. Activities supported by IS are described as the processing of data into information [11; 91] or disseminating and delivering information [25; 67]. This relates IS to action and use [30; 74; 75]. IS are thus frequently understood as related to work activities [34], serving organizational objectives [46] or problem solving [63].

4. Discussing Definitions of IS

Finding different groups of definitions of IS in the literature points to a level at which some generality in the understanding of what an IS entails can be found. To further investigate these differences and exemplify the value of the contributions made by each view of IS, we engaged in additional searches for literature. Subsequently we were looking for literature that could shed further light on the rationale for, and contributions made by each view, as well as examples of theorizing grounded in a particular understanding of IS. The following section thus highlights that all four groups of definitions of IS have made and continue to make important contributions to both IS research and practice.

4.1 Discussion of the Technology View

The technology view of IS is generally driven by the observation that IT is important for organizations and that its importance has risen dramatically over the past few decades [38] being now ubiquitously present in virtually every aspect of organizational life [28; 70]. At the same time as the importance of IT is rising, so too is the range and sophistication of IT used by organizations. For instance, enterprise resource planning (ERP) systems – complex software systems designed to provide integrated support to business processes and decision making across an organization – are seen as a necessity for conducting business in a modern-day economy [44]. ERP, like other IT systems, are assumed to have agency thus motivating investigations of their effects on organizations.

The technology view points to an important aspect of IS, that is, its technological foundation. Competitive pressures are motivating organizations to make ever more efficient, effective and innovative use of IT in transforming intra- and inter-organizational processes. This particular need in organizational life is one that is addressed by IS research and practice as it occupies a gap between, on the one hand, software engineering and, on the other, the business/organization. The technology view thus highlights the importance of IT to IS development, deployment and use in practice. This aspect is made evident by the particular presence of such definitions in IS textbooks.

Moreover, the technology view urges IS researchers to focus their theorizing on technology and its role for and impact on organizations. For instance, research focusing on technology identified phases of IT adoption in organizations [e.g. 61]; theorized the relationship between IT investments undertaken by organizations and organizational performance [e.g. 15; 55; 80]; and the succession process for different generations of IT [e.g. 6]. Most importantly, the preoccupation of IS researchers with technology has led to a widening in the conceptualization of technology [e.g. 62; 70; 71; 78] and to an ongoing debate on the importance of IT for the field of IS [e.g. 3; 43].

4.2 Discussion of the Social View

The main rationale for the social view is that it is humans who use IS, interpret information generated by the system, create meanings and undertake actions. It is the humans not the IT who make the IT output meaningful and actionable. It is human activity that enables organizations to deploy IT to achieve their goals and, more importantly, set the goals themselves as part of strategies for future development. What is important in these processes are the sociocultural contexts, social structures and power structures in which IS are embedded and in which their output becomes meaningful and is used with particular effects [56]. Broadly speaking according to this view, IS and their meanings and use are socially determined.

The social view of IS highlights the importance of social context, social actors, social actions and social structures as part of a group, organization or society. It therefore motivates IS research to look in two directions. Firstly, it inspires IS research to look more closely at the social processes taking place in organizational contexts which affect the development, implementation and use of IS. Informed by the social view IS research attributes agency to social actors, for instance, focusing on how social actors shape the adoption and use of technology in organizations [56]. This understanding can thus answer the question that is puzzling the technology view: why is it that the same IT can have different effects in different social

settings? Secondly, as it emphasizes the importance of social actors, the social view encourages a closer look at the role of actors as both individuals and collectives. Thus, the social view of IS encourages research that contributes to the understanding of, for instance, the role of power and IT [e.g. 39]; technology acceptance[e.g. 7; 23; 81]; or human computer interaction and usability [e.g. 77; 95].

4.3 Discussion of the Socio-Technical View

The rationale for adopting a socio-technical view has been to address and overcome the shortcomings of the technology view and the social view. One of the original reasons for the socio-technical view is the observation that IT tends to fail if social aspects are not adequately considered during the development and deployment of IS [14]. Similarly, social or cognitive aspects alone cannot determine the adoption and use of technology. The deployment of IT in a work context participates in the changing nature of work, how it is organized and carried out [96]. Thus, the adoption and use of IT cannot be understood purely in social (constructivist) terms. As a result, social and technological aspects of IS need to be seen and researched in concert [94].

The socio-technical view of IS addresses weaknesses of both determinist tendencies – the technological and the social – in conceptualizing IS. IS are explicitly seen as complex phenomena arising at the intersection of the technological and the social [54]. The socio-technical view has a long tradition in IS and has made many important contributions to IS research [66; 79]. For instance, a socio-technical understanding is the foundation for soft systems methodology that considers social actors and their use of technology in parallel [21]. In particular, socio-technical definitions of IS raise awareness that unidirectional relationships between technology and social actors or vice versa are insufficient for understanding the role of technology in organizations. Instead, they indicate that technology and social actors interact in multiple ways and that this interaction can be alternatively described by referring to structure or network as an analogy.

The socio-technical view is seen as the most promising view of IS [79], one that has the potential to be further developed to account for a sociomaterial nature of IS [17]. It opened a space and provided the methods to examine the technological and the social as they interact during the development and implementation of IS [66]. It allowed for the adoption of many rich concepts such as imbrication [e.g. 22; 57] or structuration theory as ways for understanding the interaction of social and technological aspects of IS [e.g. 41; 70].

4.4 Discussion of the Process View

In contrast to the social view, the technological view and the socio-technical view, the process view emphasizes the activity dimension associated with IS rather than technology, social actors or their mutual interaction. Central to understanding IS according to the process view are the activities that are performed and supported by an IS [1]. This is highlighted by definitions referring to aspects such as: use, storing, creating, exchanging, communicating, collecting, disseminating, transmitting, manipulating, providing, retrieving, etc. which are all associated with activities that are supported, facilitated or enabled by an IS. While the process view assumes that social actors and technology are implicated in the activities supported and enabled by IS, it considers the activities to be of primary importance [2].

As the process view emphasizes the activity aspect of IS, it leads IS researchers to look at how activities undertaken by social actors can be performed and/or supported by technology [1; 2]. This encourages IS research to look at work activities and the use of technology in regards to these activities, such as how work processes can be supported, enabled or automated through the use of technology. For instance, technology is used to trigger orders at particular stock levels in a warehouse and to reorder optimal quantities so as to minimize costs (or stock-outs). In such a way, inventory management is optimized though automated decisions. Thus, the process view makes an important contribution to IS research, for instance, by shifting attention to information flows and work flows in organizing contexts and how they can be automated and optimized [e.g. 1; 26; 84]. This view of IS stimulated research on supply chain management [e.g. 31], research on human information behavior and how the process of fulfilling information needs can be facilitated through the use of technology [e.g. 40]; or how processes such as collaboration can be facilitated through technology [e.g. 19; 33].

5. Critique of Definitions

As we discussed above different views of IS are making particular contributions to theorizing in IS research. However, what is still missing is a critical reflection on each of these views and how the assumptions underpinning each view limit the theorizing. To engage in such a reflection we looked for further literature critically discussing general assump-

tions regarding IS and IT. As part of this we also looked at epistemological and ontological assumptions, and potential limitations associated with these positions. This section provides a brief critical reflection on each of the four views of IS. Importantly, the purpose of this critique is to outline potential limitations for theorizing that are inherent when taking a particular view, rather than dismissing it or research it informs.

By emphasizing IT (or IT artefacts) as key defining components of IS, the technology view can overlook or underplay the importance of social conditions and concerns in the development, adoption and appropriation of IT. As social aspects shift out of focus they, therefore, risk becoming invisible and unrecognized. Furthermore, by taking IT as given and fixed the relationship between IT and organizational processes and performance is seen as uni-directional. Hence the typical research question within this view is how do IT impact on organizations and their performance. Such tendency of the technology view of IS to adopt a technology deterministic perspective has attracted its fair share of criticism in the literature [42; 56; 59]. For instance, it is well documented that the implementation of a particular IT has unplanned and often unpredictable outcomes implying that the same technology often leads to different outcomes in different contexts [42; 56]. Consequently, technological determinism has shown to be problematic and technology is no longer seen as a sole independent variable but instead as a moderator [70]. Nevertheless, if technology is understood to be an independent or a moderating variable, the technology view is frequently grounded in "an ontological commitment to a world of discrete entities that have some inherent and relatively stable characteristics. ...[individual actors and things] are seen to be largely independent, but linked through uni-directional causal relationships, and having largely determinate effects on each other" [70, p. 439].

While the social view of IS addresses some of the challenges of the technology view it is partial nevertheless: it overemphasizes the social at the expense of the technological. Different technologies provide different opportunities to an organization to transform and innovate its processes and the emerging organizational changes cannot be explained only by social actions or social forces. A particular technology plays a role in the reconfiguration and transformation of work processes that can lead to a change in the way that work is undertaken or how organizational units are organized [57]. However, by assuming IT as malleable and socially determined the social view disregards the agential potential of technology and its role in affecting the social. This position is described as 'voluntarism' by [56] or 'social determinism' by [42]. In this sense, the social view of IS is underpinned by a similar dualist ontological position, however, unlike the position of the technology view, it is the social that is privileged, largely assumed to determine the technology use and its impacts. The social view thus sees "organizational change as driven by social forces upon which the technology has little, or no, influence. In this research, the properties and performance of the technology are assumed to be largely dependent on other organizational influences, for example, strategic choices, distributions of power, information processes, and local contexts of use" [42, p. 295].

The socio-technical view that aims to overcome both the technological and the social determinism, has been critiqued for failing to do so in practice and to account fully for the social and the human side of IS deployment [17; 66]. The socio-technical view, for instance, enabled the justification of systems that negatively affected workers [66]. While this criticism does not refer to an intrinsic failure of the socio-technical view, but rather the way in which it has been applied, this should be of concern to IS researchers and practitioners. Furthermore, while the socio-technical view of IS opens a space for understanding the social and the technical in concert, it still assumes a social/technical split. By focusing on and engaging with both the social and technological elements, the socio-technical view assumes an ontological separation between them: "[W]hat remains unquestioned in this logic is the assumption that technology and humans (or organizations) are separate in the first place" [70, p. 455]. A socio-technical view of IS thus can overlook the importance of ongoing practice that questions this ontological separateness [32].

And finally the process view of IS tends to see human activity in a way in which an action (individual task) or a succession of actions (processes) is executed by humans and machines. This understanding, however, lacks an appreciation of the wider contexts in which the activities and processes are performed and thus takes the overall purpose and rational as given. While it can be seen as pragmatic and matter-of-factual the process view is limited as it often does not question the purpose and objectives imposed on the processes to be performed or supported by IS. The process view therefore often does not foster a critical assessment of the broader organizational context in which processes are performed [32]. Moreover, it lacks an appreciation of the continuously changing sociocultural backgrounds relevant to these activities and processes [32; 90]. Finally, the process view, despite its focus on processes, does not recog-

nize the relevance of material aspects of practice and ongoing sociomaterial performances that produce and reproduce IS-supported processes [71].

6. Discussion and Conclusion

The present review of IS definitions shows that information systems are complex phenomena and that different approaches to conceptualizing IS allow for different angles of seeing, understanding and researching these complex phenomena. Grounded in the hermeneutic review of different definitions of IS in the literature we discerned four major views of IS: a technical view, a social view, a socio-technical view, and a process view, each underpinned by a specific set of assumptions. The discussion about these views showed that each has made important contributions to understanding and researching IS phenomena, but also that each view provided limited insights into IS phenomena. By conducting this review we also responded to the call for IS to engage with its core concepts by investigating how 'information systems' are conceptualized in the IS discipline [5; 54; 87].

Given the complexity and evolving nature of IS phenomena in organizations and society, it is not surprising that IS definitions are all limited, focusing as they do on specific components or aspects of IS. Each of the four conceptualizations discussed in this paper can be seen as useful and applicable to theorizing a particular research problem or a situation, allowing researchers to narrow their studies and explore specific research questions. Each view therefore can be seen as fit for purpose as long as we recognize its limitations and do not assume its universal validity. One lesson that can be learned from the review of different views of IS is that the IS discipline would benefit from a healthy dose of criticality toward its key concepts and the ways they are used in research and practice. Furthermore, our discussion indicates that IS researchers should not be complacent and should explore further opportunities for conceptualizing IS that are less limiting. This requires an ongoing debate about the IS field, its core concepts and assumptions, its domain, interests and aims [3; 5; 27; 43; 54; 83; 85; 87]. By looking at existing definitions of IS and critically reflecting on how IS are conceptualized, this paper makes a contribution to this debate.

A critical and reflexive attitude is particularly beneficial for revisiting our common and largely taken for granted assumptions about human and social actors, technology, and the ways they interact in the modern digital era. As our discussion demonstrates all four views of IS are founded on the unquestioned assumption about the separate existence of the human/social and the material/technological. Such ontology is essentialist and dualist [17]. It is essentialist in a sense that it assumes humans and technologies (and other objects) are self-contained entities, characterized by their essential properties that determine what they are, including a priori boundaries between them. While these entities interact and influence each other they remain what they are as their essential properties do not change. This also implies ontological dualism between subjects (human beings) and objects (non-humans, technologies) and between an individual and the external world of which an individual can only have mental representations, often enabled or mediated by IS [78]. Whether privileging and locating agency in the human/social or the technological, or attempting to attribute agency to both [57], the conceptions of IS are grounded on the essentialist and dualist ontology. Most importantly such assumptions are commonly held in IS research and are rarely explicitly mentioned or reflected upon.

It is therefore timely to remind ourselves that we always make assumptions about the world and that they help us in our investigations and theorizing. But these very assumptions also constrain the ways we see and investigate the world and thus limit our ability to learn and explain phenomena that matter. The different views of IS have served us well as long as the underlying assumptions were plausible enough to account for and explain various IS phenomena before the digital era of the Internet, WWW, mobile technologies, digitization of products, and cyborgs [71]. In the digital era human existence and experience have become so entangled with numerous technologies that assuming their separate existence has been increasingly difficult to defend [71]. Our conceptions of IS, are therefore lagging behind the emerging IS phenomena in practice. Taking assumptions of specific IS conceptualizations for granted is increasingly problematic and can become a conceptual straitjacket for future IS research.

Currently all of the identified definitions are grounded in an ontological position that separates technology and social actors. We suggest that conception of IS can be advanced by going beyond such ontological position. One opportunity to do that is emerging with the development of sociomaterial approaches to IS and organizing [17; 69]. We specifically propose the sociomaterial theorizing that is founded on *relational ontology* according to which human beings, technologies and things, do not preexist with inherent properties but instead exist and acquire their properties only in relations [4; 17]. Consequently a sociomaterial conception of IS would imply a web of relations in which social and human

actors, technologies, information, data, practices of IS development or use and other things are intra-acting and mutually co-constituting. An IS can thus be seen as a composite and shifting assemblage, always in becoming, continuously performed through the intra-acting in the web of relations [13]. Such a view of IS can be developed further to accommodate the development, deployment and use of an IS in a context.

While it is beyond the scope of this paper to elaborate the alternative new view of IS founded on sociomateriality, we envisage future direction for research opened up by exploring a conception of IS grounded in non-dualist and non-essentialist assumptions. Useful ideas in this direction may be drawn from science and technology studies [10; 16], actor network theory [49; 50] or the mangle or practice [76]. We believe that expanding the current understanding of IS in this direction can help the discipline to uncover new and exciting directions for its research in the future.

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