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Theoretical foundations for the study of sociomateriality ☆

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ABSTRACT

This paper compares two alternative theoretical foundations upon which the study of sociomateriality can be built: agential realism and critical realism. It begins by providing a brief overview of the sociomaterial perspective on organizational practices and considers why this perspective holds great appeal at this point in time. I then engage with Mutch's (this issue) critique of the agential realist foundation upon which most current discussions of sociomateriality are constructed to highlight what practical problems are generated when authors attempt to map agential realism's philosophical discussion onto empirical phenomena. Next, I attempt to make explicit what Mutch leaves implicit in his paper: how building studies of sociomateriality on the theoretical foundation offered by critical realism can, potentially, overcome some of the practical problems created by a footing on agential realism. Finally, I push Mutch's arguments one step further to compare what practical consequences arise when researchers attempt to construct studies of sociomateriality on either of these two theoretical foundations. I suggest that there are important implications for what one can study, how one can study it, and how scholars can contribute to theory on technology and organizing based on the theoretical foundation they choose to build upon.

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1. Introduction

Students of information technology in organizations are an ironic bunch. The first definition of "technology" appearing in most English-language dictionaries emphasizes the *practical* utility and application of knowledge to a particular domain. But for nearly four decades now, information systems (IS) scholars have bemoaned the lack of *theoretical* sophistication and absence of native theories within the field, arguing that the most practical of all subject matter should become much more theoretical (Gregor, 2006; Straub, 2012; Watson, 2001). Well, their wish has come true. Today one of the most popular, most cited, most debated, and most critiqued topics in the fields of information systems and management is the topic of sociomateriality (see for discussion, Leonardi, Nardi, & Kallinikos, 2012). The concept of sociomateriality is extremely theoretical. Authors who write about sociomateriality attempt to make a pointedly philosophical statement about the relationship between the social and the material that begins, quite overtly, with the name "sociomaterial" — a deliberate fusion of the words "social" and "material." As Orlikowski (2007: 1437) is often cited as saying about sociomateriality: "the social and the material are considered to be inextricably related — there is no social that is not also material, and no material that is not also social."

If discussions of sociomateriality have not yet reached a high enough philosophical plane to satisfy those who would see the field of IS become more theoretical, the latest machinations of authors within this perspective will not lead to disappointment. With the general theoretical premise seemingly well accepted that the social and the material are so fundamentally related that it makes little sense to talk about one without talking about the other, scholars have begun to quibble about the theoretical foundations upon which a sociomaterial perspective should be built. And it is at this level of discussion about the theoretical foundations of this emerging line of thought that Kert Lewin's aphorism about nothing being so practical as a good theory might help to break the ironic posture of the field. The seemingly fine-grained theoretical debate initiated by Mutch (this issue) about whether a move toward viewing organizational practices and, perhaps, organizations themselves as sociomaterial should be premised upon the insights provided by an "agential realist" or a "critical realist" ontology has very *practical* consequences for questions scholars ask, the phenomena on which they focus their attention, and, ultimately, the insights and ideas they can generate to improve the way that organizations operate. In fact, as I will suggest below, it is probably the first significant attempt thus far to consider how we might turn a philosophical discussion into practical theory.

To build toward this point, I first provide a brief overview of this notion of sociomateriality and I consider why we are grappling with it at this point in time. I then engage with Mutch's critique of the agential realist foundation upon which most current discussions of sociomateriality are constructed to highlight what practical problems are generated when authors attempt to map agential realism's philosophical discussion onto empirical phenomena. Next, I attempt to make explicit what Mutch leaves implicit in his paper: how building studies of sociomateriality on the theoretical foundation offered by critical realism can, potentially, overcome some of the practical problems created by a footing on agential realism. Finally, I push Mutch's arguments one step further to compare what practical consequences arise when researchers attempt to construct studies of sociomateriality on either of these two theoretical foundations. Although this current paper follows Mutch in making a critique of agential realism, it does so not because I believe that the theoretical foundation of agential realism is in any way inferior to the theoretical foundation of critical realism, but because the genre of critique allows me to most efficiently showcase their differences and the practical choices those differences imply.

2. The social, the material, and the sociomaterial

2.1. Sociomateriality and agential realism

What does it mean to say that something – a technology, a practice, an organization – is sociomaterial? The answer to this question seems to depend a great deal on who is asked. The simplest answer would be to say that the phenomena in question are simultaneously social and material. Still, it is not clear what that means. What is social? What is material? Answering these questions requires some ontological footing. By far, the most widely accepted route to an answer to this question comes through the writings of Wanda Orlikowski

(Orlikowski, 2007, 2010; Orlikowski & Scott, 2008) who has drawn upon the works of science studies authors such as Latour (1987, 1992, 2005) and Barad (1996, 2003, 2007) for philosophical inspiration.

Latour's work on actor-network theory (see Latour, 2005 for his latest and most comprehensive thinking on the matter) makes the argument that there are no inherent differences between the social and the material. Instead, scholars often make an arbitrary distinction between "material" and "social" in their writings about human behavior and institution. Latour has long suggested (see for example, Latour, 1987) that sociologists, specifically, and social scientists more generally, have defined the "social" as their area of provenance and have classified discussions of anything material (e.g. the nature world, technology, etc.) as a-theoretical and uninteresting, and consequently, not within the domain of the social theory. Latour's project has been to demonstrate that sociologists often draw unempirical-based lines around phenomena in their attempts to classify and direct programs of study. Thus, saying that something is social and another thing is material is a fantasy concocted by disciplinary pundits for political or practical reasons (see also Leonardi, 2009). Latour argues that no phenomena can be adequately described unless scholars abandon artificial distinctions between lines of thought, and direct their attention to the empirical reality that people, ideas, objects, artifacts, nature, and the like are all joined together in an intricate network of associations that develop momentum over time.

Barad's line of thinking is complementary, and no doubt influenced by actor-network theorizing. But Barad differs slightly in that her concern with the distinction between the "social" and the "material" is almost more epistemological than ontological. Barad is interested in how people – scientists in particular – *know* what is "out there" in the world. "Out there" (my term) is placed in parenthesis because Barad's nuanced argument is that in their attempt to get to know the world, scientists develop machines and other apparatuses that will capture it. In so doing, scientists are developing particular renditions of the so-called "reality" as they attempt to explain it. Thus, the world is not "out there" waiting to be found and explained; rather, it is constructed intersubjectively in our attempts to represent it. Central to Barad's argument is the recognition that scientists and the machines they employ attempt to isolate particular agencies. As she argues, the…

> term "agencies of observation" is evocative of the central role of agency in the new epistemological and ontological framework… "Agencies of observation", instead of the more common term "observer", already signals the inseparability of the material and semiotic apparatuses. That is… the material and semiotic apparatuses form a nondualistic whole. In other words, classical descriptive concepts obtain their meaning by reference to a particular physical apparatus which in turn marks the placement of a constructed cut between the "object" and the "agencies of observation". Finally, the point of reference for unambiguous communication is "from permanent marks such as a spot on a photographic plate, caused by the impact of an electron left on the bodies which define the experimental conditions" (Bohr, 1963: 3). Therefore, "bodies which define the experimental conditions" serve as both the endpoint and the starting point for meaningful observation. (Barad, 1996: 172).

Thus, phenomena in the world, including humans, act, but our attribution of agency to them is done post-hoc. As Barad (1996: 182) notes, "the adjectival form of the word "agency" modifies and specifies the form that realism takes here, in defiance of traditional forms of realism that deny any active participation on the part of the knower. Agency is a matter of intra-acting, that is, agency is an enactment, it is not something someone has."

When adopting the standpoint that observers – or "knowers" as Barad calls them – are co-authors of the phenomena they are considering, agencies are seen to be products of the knowledge-making process as opposed to properties of any specific actors. For this reason, Barad takes the further step in arguing that agencies themselves are the product of observer-phenomena relations.

> On my agential realist elaboration, phenomena do not merely mark the epistemological inseparability of "observer" and "observed"; rather, phenomena are the ontological inseparability of agentially intra-acting "components."… It is through specific agential intra-actions that the boundaries and properties of the "components" of phenomena become determinate and that particular embodied concepts become meaningful. A specific intra-action (involving a specific material configuration of the "apparatus of observation") enacts an agential cut (in contrast to the Cartesian cut – an inherent distinction – between subject and object) effecting a separation between "subject" and "object." That

> is, the agential cut enacts a local resolution within the phenomenon of the inherent ontological indeterminacy (Barad, 2003: 815).

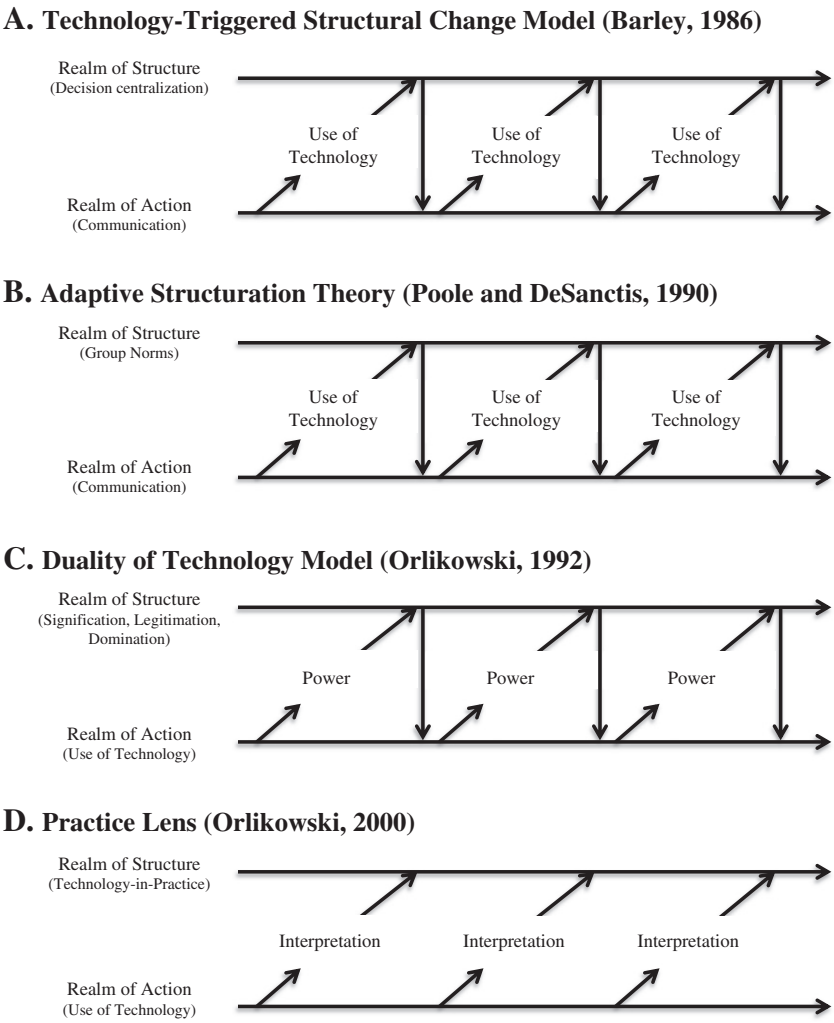
Put differently, objects or phenomena do not have agency; people attribute agency to them when they use equipment, machines, formulae and other various apparatuses in an attempt to explain the machinations of the universe through the imposition of causality. Barad's "agential realism" thus combines an ontological commitment to treat phenomena as discursively constructed and with an epistemological stance that treats our knowledge about the natural world as something that is not only tied to but inextricably bound with the technologies we use to observe it.

Of course, this is all quite philosophical. And, these complicated arguments seem far removed from the study of organizing broadly, and the use of technologies more specifically. Orlikowski's appropriation of agential realism in her formulation of a sociomaterial perspective brings this philosophical discussion into the domain of organizational analysis. To understand just how agential realism became an attractive theoretical foundation on which to build a perspective on sociomateriality requires a little history, and a lot of consideration of structure.

2.2. Structuration theory and shifting definitions of "structure"

The earliest research on technology use in organizations examined the effect of technology (typically large manufacturing processes) on organizational structure (conceptualized in a variety of ways, such span of control, centralization, or departmentalization). The core question for early organizational contingency theorists was whether certain technologies demanded particular organizational structures in order for organizations to be effective (Thompson & Bates, 1957; Woodward, 1958). A hallmark of contingency theory thinking is equafinality, or the notion that there is not one kind of structure best for all situations. Rather, different structures are more or less equipped for dealing with various environmental stimuli, such as technological change. Thus, the lasting legacy of organizational contingency theorists was to advocate for a deterministic relationship between technologies and organizational structures (Scott, 1990). Although many studies challenged the empirical findings presented about the optimal organizational structures for particular kinds of technologies (Aldrich, 1972; Blau, Falbe, McKinley, & Tracy, 1976), and several famous studies attempted to argue that the technologies themselves were merely justifications for structural changes managers wanted to make anyway (Child, 1972; Davis & Taylor, 1976), there were no real conceptual critiques of the underlying deterministic relationship until the mid 1980s when Barley (1986) famously argued that technologies might not be structural determinants, but rather their implementation in organizations were occasions during which organizational actors could re-evaluate or re-imagine the structures in which they worked. To make this argument, Barley employed Giddens (1979, 1984) structuration theory in a slight-of-hand of sorts.

Because structuration theory held that abstract social structures like social class (which organization theorists then figured could be simply transposed to a discussion of organizational structures, like centralization) were both the medium and outcome of human action, Barley reasoned that if one could demonstrate that technologies affected interaction among people, one could aggregate these interactions in such a way to claim that there was a concomitant change in organizational structure. In other words, Barley operationalized social interaction as interpersonal communication and, adopting the premises of structuration theory, assumed that interpersonal communication formed, in the aggregate, organizational structure. As depicted in Panel A of Fig. 1, Barley's use of structuration theory treated technology as a pivot point between action (communication) and structure (centralization of decision making). In Fig. 1, the two realms of social organization — action and structure, are depicted as horizontal arrows signifying flows through time. The structural realm represents an abstract framework of relations derived from prior interaction on which organizational members draw to enact their work practices. The realm of action refers to the specific interactions between people in real-time. The diagonal arrows moving from the realm of action to the realm of structure signify actions' slow but cumulative constitution of structure. The vertical arrows moving from the realm of structure to the realm of action show structures' more direct and immediate effect on quotidian communication. In Barley's study, as actors used the new technology and oriented themselves to it, they changed their communication, which, over time, altered decision rights allocated to different occupations. Barley demonstrated that the radiology departments within two



Note: Horizontal arrows signify flows through time. Diagonal arrows signify actions' slow but cumulative constitution of structure. Vertical arrows signify structures' more direct and immediate effect on quotidian interaction

Fig. 1. Influential structurational approaches of technology use in organizations.

hospitals who adopted the same Technicare 2060 CT Scanner both ultimately became more decentralized over time, but become so in different ways and at different levels of intensity.

Within the IS literature, an even more influential application of structuration theory to technology use came from the development of Poole and DeSanctis' (DeSanctis & Poole, 1994; Poole & DeSanctis, 1990, 1992) Adaptive Structuration Theory (AST). Like Barley, Poole and DeSanctis appropriated structuration theory to explain the relationship between technology and social interaction. While, like Barley, they also focused on interpersonal communication as the way that social structure was enacted in everyday practice, they considered social structure, in the abstract, to be the norms of behavior governing small, decision-making groups (see Panel B, Fig. 1). In their formulation of AST, technology use was also the modality of structuration (DeSanctis & Poole, 1994). Poole and DeSanctis focused specifically on how members of student groups used the various features of the group decision support technology under study to enact decision-making norms (Poole & DeSanctis, 1992).

In these two appropriations of structuration theory, the technology-triggered structural change model and adaptive structuration theory, technology use mediated between action and structure by providing people with new capabilities and opportunities to do things they could not do before. In Barley's terms, new technologies provided affordances that created a "slippage" between action and structure and in DeSanctis and Poole's words new technologies could reconfigure structure through "ironic appropriation" of the technology's features. A third application theory of structuration theory to technology use – Orlikowski's (1992) duality of technology model – changed the premise entirely. Whereas the technology-triggering model and AST both conceptualized "action" as the communication among people that was altered by technology use, Orlikowski operationalized action itself as technology use. In her duality of technology model, people's technology use was the actions out of which organizational structures were constituted (see Panel C, Fig. 1). In other words, technology did not have effects on organizational structure through communication; instead, technology use was the micro-level action that aggregated into macro-level organizational structure. This formulation placed technology in a central role in the organizing process. Orlikowski suggested that powerful actors shaped how people used the technology and how particular uses diffused across the organization. These actors did so to reinforce their abilities to signify, legitimize, and dominate particular organizational practices. Of course, people could rebel and use the technology differently, which would then lead to change in the (organizational) structures of signification, legitimization, and domination. Thus, in the duality of technology approach, technology use becomes a constitutive feature of organizational structure.

In the narrative I construct linking agential realism to sociomateriality via structuration theory, the duality of technology model is important, apart from its tremendous influence on the field, as a waypoint to Orlikowski's (2000) practice lens. Having already conceptualized technology use as a constitutive feature of structure in its own right, Orlikowski, shifted the operationalization of structure to again bring technology more into the center of organizational analysis. In the development of the practice lens, the "technology-in-practice," which Orlikowski (2000: 407) defined as "a particular structure of technology use," was substituted for broader and more abstract types of social structures specified in the prior structurational approaches: centralization, group norms, or structures of legitimization, domination, and signification. Thus, the practice lens argued that certain patterns of technology use aggregated into particular "technologies-in-practice" as people formed interpretations, in the practice of their work, about how the technology's features would help them accomplish tasks and social interaction with others (see Panel D, Fig. 1). Note that there are no downward thrusting vertical arrows in Panel D because the practice lens treats structure as if it were always in a state of "becoming" (for a more detailed discussion see, Cooren, 2010).

Since the formulation of the practice lens, many scholars have begun to consider how the ways that people use technologies lead, through interpretive processes, to particular patterns of technology use that become institutionalized as the normal state of affairs within and across organizations (e.g. Baptista, 2009; Boudreau & Robey, 2005; Davidson, 2002; Majchrzak & Malhotra, 2004; Schultze & Orlikowski, 2004; Vaast & Walsham, 2005). But perhaps more importantly, the practice lens has been criticized for offering an overly socialized view of technology. This critique comes from the fact that the realm of action consists of people choosing to use a technology in a certain way. Here, the technologies themselves are only peripheral players that are subject to the whims of their users. For example, Orlikowski (2000: 412) argues that that even though technology's have certain physical or digital properties that transcend specific contexts of use, "users have the option, at any moment and within existing conditions and materials, to 'choose to do otherwise' with the technology at hand. In such possibilities to do otherwise lies the potential for innovation, learning, and change." Then, of course, at the macrosocial level, a technology-in-practice is really nothing more than a set of norms governing when, why, and how to use a technology in a specific setting. Although technology is the object of inquiry in studies adopting a practice lens, there is virtually no technology there to be found in most empirical accounts that employ it because action (technology use), structure (technology-in-practice) and modality (interpretation) are all fundamentally social. Their theoretical formulations depend on the existence of some technology, to be sure, but we only see the reflection of that technology in the enactment of social processes in the practice lens.

In levying their critiques against the over-socialized view of technology's role in the structuration process that is implicitly encouraged by a practice lens, an increasing number of authors have attempted to bring technology back into the picture. Most studies that have attempted to do so have employed an empirical strategy by focusing closely on the specific features that the technology provided to its users and documenting how and why users employed those features in the course of their normal work

(e.g. Leonardi, 2007; Svahn, Henfridsson, & Yoo, 2009; Volkoff, Strong, & Elmes, 2007). Other studies have employed a more philosophical strategy by discussing the nature of an object's permanence and lack of malleability across social boundaries (e.g. Jackson, Poole, & Kuhn, 2002; Kallinikos, 2004; Leonardi, 2009). Both of these avenues – the empirical and the philosophical – led to the same tendency: to treat technologies themselves as if they were a structural property that existed outside the space-time of normal interaction. Thus, technologies became phenomena that existed in the "realm of structure" while technology use existed in the "realm of action." By treating technologies themselves as institutional structures, researchers could show how and why the materiality of a particular object – the ways its physical or digital materials were arranged into particular forms that endured across changes in place and time – could be seen to shape technology use patterns for users themselves, and for the groups and organizations in which they worked. This view represents, perhaps, a form of soft determinism (Smith, 1994) wherein the technology itself is given some causal priority in the explanation of usage patterns.

Orlikowski's formulation of a sociomaterial perspective to organizational practices responded to these critiques in two important ways. The first shift involved an important language game. By ceasing to talk about "technological artifacts" and "technologies-in-practice" and by referring to these phenomena instead as the "social" and the "material" harkened a subtle, but important change in the way people oriented to the phenomena under study. This shift was certainly intentional for Orlikowski's argument that mainstream management scholars should begin to attend more squarely to the role technology plays in their phenomena of interest (e.g. identification, procedural justice, negotiation, institutionalization, etc.) crescendos from 2007 to 2008 to 2010. Moving from a discussion about technology to a discussion about sociomateriality aims to remind those who would not normally make an explicit consideration of technology in their work to attend to the importance of the technical bases of organizational life, without using the term "technology" directly. The use of the term "sociomaterial" also builds on the structurational approaches to technology, which showed that all technological artifacts were created through social interaction among people and that any effects that those technological artifacts could have on the organization of work were buffered and shaped by social interaction. Thus by moving from "technology use" and "technological artifact" to "social," "material" and ultimately "sociomaterial" one could make the philosophical statement that all action that constitutes organization is no more or less social than it is material.

The second shift was marked by the important transition from structuration theory to agential realism as an ontological foundation. Whereas the evolution of structurational arguments concerning technology had evolved to the point (as depicted in Fig. 1) where the technologies themselves and the actions taken by the people that used them interacted recursively, over time, agential realism denied any separation between technologies and technology use, the "social" and the "material.," and more profoundly, the realms of structure and action. As Orlikowski (2007: 1438), drawing on Barad, argued: "we have tended to speak of humans and technology as mutually shaping each other, recognizing that each is changed by its interaction with the other, but maintaining, nevertheless, their ontological separation. In contrast, the notion of constitutive entanglement presumes that there are no independently existing entities with inherent characteristics (Barad, 2003: 816)." When resting on the theoretical foundation of agential realism, a sociomaterial perspective argues that there is no social that is separate from material, there is only the sociomaterial. Any difference we would claim that exists between them results from an "agential cut" (to use Barad's term) made by researchers who want to arbitrarily identify something as "social" and something else as "material." The natural world, in Barad's writings, or the organizational practice, in Orlikowski's writings, knows no distinctions; only the people using apparatuses such as structuration theory to capture what is "out there" notice distinctions as they enact them in their writings. In short, when resting upon the theoretical foundation of agential realism, a sociomaterial perspective breaks away, profoundly, from the tethers of structuration theory into a philosophical stance in which there is "no social that is not material and no material that is not social" (Orlikowski, 2007: 1437).

3. An alternative theoretical foundation: critical realism

3.1. Problems arising from the theoretical foundation of agential realism

It is against this backdrop that Mutch (this issue) urges those interested in sociomateriality to pause for some reflection. Mutch contends that although the move to redress the "neglect of the material in broader

social and organization theories" (p. XX) is admirable, there are some major drawbacks to erecting a perspective of sociomateriality upon the theoretical foundations of agential realism. Mutch lays out four major problematics; these are summarized in the first two columns of Table 1. The first is the lack of unique explanatory power of agential realism. As Mutch suggests, "it is not easy to see how this is used to generate insights that would not be gleaned through other approaches" (p. XX). He suggests that actor-network theory and even socio-technical systems theory could provide many of the same insights about empirical phenomena as agential realism, but do so without such dense philosophical ideas.

Second, he argues that although the philosophical rejection of a subject–object dualism in agential realism is attractive from a philosophical standpoint, researchers have a great deal of trouble using this idea to engage empirical data. He cites Wagner, Newell, and Piccolo (2010) who report on their experience attempting to use a sociomaterial perspective grounded in agential realism to analyze their field data: "We found it quite challenging to keep the material in the storyline without falling from one side to another — either leaving the material realm unexamined, or emphasizing the agency of the material at the determinant of understanding the entangled practice" (p. 292–293). Faulkner and Runde (2012) have also spotted this particular problem with agential realism, suggesting that the thesis of interpenetration of the material and the social makes the operationalization of empirical constructs difficult. Leonardi (2012a) has taken this argument one step further. He argues that there is much to be gained from a perspective, like agential realism, which collapses the distinction between the material and the social, on the one hand, and technology and organizing on the other. But he suggests that this philosophical stance presents empirical problems because actors in the world do not perceive the material and the social or the technological and the organizational as interpenetrated entities. Instead, they can relatively easily point to a hammer or a piece of software and say "this is material" but they would likely have a hard time fathoming that a hammer was in any way social. That is not to say that the interpenetration thesis is philosophically wrong, but only that actors in the empirical world act is if it is not true (see also, Barley, 1988), which of course has consequences if one follows the admonition that field researchers should strive to take the point-of-view of the actors they observe (Van Maanen, 1988).

Table 1
Problems for sociomateriality arising from agential realism.

Problems arising from the adoption of "agential realism"	Reasons why problems exist	Solutions to problems from the adoption of "critical realism"	Reasons why problems are avoided with "critical realism"
Lack of explanatory power (of empirical phenomena)	Conflation of realms of action and structure precludes an examination of "becoming" and shifts the focus to what "is," which leads to descriptive studies	Treating materiality as existing in the realm of structure and social action as existing in the realm of action	Use of an *analytical dualism* between structure and action
Inability to perform empirical studies that actually demonstrate "sociomateriality"	Empirical operationalization forces scholars to define, at least implicitly, what is "material" in the context they are studying, which decouples a phenomenon that would otherwise be "sociomaterial."	Shifts locus of explanation from *what* things are to *why* they *appear* to be as they are	Ontological separation of "social" from "material" accords with actors' categorization with and experience of phenomena
Overlooks how practices are sustained and changed	Absence of a theory of temporality due to conflation of social and material	Specifies mechanisms that link action and institution (social and material) over time	Includes an explicit theory of temporality
Treats all relations as mutually constitutive or co-dependent	Reliance on a thesis of "interpenetration" and a conceptualization of the social and the material as *internal relations*	Examines how "social" and the "material" become constitutively entangled to produce the "sociomaterial"	Employs a theory of morphogenesis to argue that materiality, as a "structural" property, pre-exists action — people's use of a technology

Third, Mutch argues that agential realism ignores time. This is problematic, as he suggests, because a lack of temporal flow in a theory of constitution reduces considerations of structure and institution…

> … to the practice reflected on by particular informants and contingently observed by an external party. That such approaches can yield rich material is not in question, but social structures are not necessarily transparent to participants…. [Agential realism] ignores the role of time in producing particular constellations of position-practices that emerge from the activity of persons, but are not reducible to that activity. Most crucially, the conditions in which such practice occurs were not produced by those now here in the present. (p. XX).

Organizations and people's practices exist in time. They unfold and change along a temporal plane. Without a consideration of time, no analyst could explain why practices arise, endure, or change. Thus while some phenomena of interest to physicists may not be affected by temporal flows, like atoms that constitute graphite (Barad, 1996: 161–162), sociomaterial practices in organizations do, as Orlikowski's (2007: 1140) own analysis of Google's page rank algorithm adeptly shows. Of course, this is a problem for students of technology and organizing because without a theory of temporality it becomes difficult to relate to or integrate with the many organization theories such as evolutionary theory (Nelson & Winter, 1982), neo-institutional theory (DiMaggio & Powell, 1983), resource dependence theory (Pfeffer & Salancik, 1978) and others that seek to explain the production, maintenance and change of organizations.

A fourth problem, not raised by Mutch, but certainly one to which he is sympathetic is the argument that "the social world is one in which humans and items of technology are in some way constituted by the relationship in which they stand to one another" (Faulkner & Runde, 2012: 52). Faulkner and Runde base this argument on Orlikowski and Scott's (2008: 455) agential realist-based claim that "people and things only exist in relation to each other." They suggest that a sociomaterial perspective that finds roots in agential realism treats all relationships (like those between the material and the social) as constitutive relations – relations in which the relation in question contributes to making what one or more of the relata are. Faulkner and Runde call such relations *internal relations*. They suggest (p. 52) that if one restricts his or her analysis to binary relations, there exists an internal relation between any pair of relata X and Y if:

- X would not be what it is but for the existence of Y, or
- Y would not be what it is but for the existence of X, or
- X would not be what it is but for the existence of Y and Y would not be what it is but for the existence of X.

But not all relations are internal. Some relations are *external relations* in the sense that although two entities are related, they do not need each (or one does not need the other) for either to exist. For example:

> While postmen and dogs often have an intimate and typically fraught relationship, it is probably not the case that this relationship is constitutive of either postmen or dogs. That is to say, at least as we see it, having interacted with a dog is not a necessary condition for someone to be a postman, just as having interacted with a postman is not a necessary condition for a four-legged creature that barks to be a dog. And if so, then all relations between postmen and dogs are external rather than internal relations. The same goes for many other things (Faulkner & Runde, 2012: 54).

To bring this example into the realm of technology and organizing, a weather scientist may normally use a computational modeling tool to estimate wind velocity, but the use of a computational tool does not make a weather scientist (it would be possible, though cumbersome, to do such estimation by hand), nor does a whether scientist make a computational tool (the tool could be used to compute many other things, such as energy dissipation in structures). The problem with treating *all* relationships as mutually constitutive is that the analyst overlooks how and why phenomena get put into relationship with each other, and, consequently, how their relationship might change phenomena other than themselves.

3.2. Critical realism as one solution to problems presented by agential realism

To address these problems, Mutch (this issue) offers critical realism as a viable alternative to agential realism as a theoretical foundation for the study of sociomateriality. There is no reason that the sociomaterial

perspective must be footed exclusively on the foundation of agential realism. There are alternative theoretical foundations upon which to build the study of sociomaterial practice, and critical realism offers a foundation that is in general agreement with the philosophical leanings of agential realism, but differs from it in the way that those philosophical arguments are translated into theoretical mechanisms. Mutch (2002, 2010, this issue), Volkoff, Strong, and colleagues (Strong & Volkoff, 2010; Volkoff & Strong, 2013; Volkoff et al., 2007), and Faulkner and Runde (2013), have described the theoretical stance of critical realism – especially as it relates to studies of technology and organizing – well elsewhere, so I will not provide an extensive review here. But there are a few points regarding the morphogenetic approach to critical realism (of which Mutch is quite fond) that bear some repeating.

Critical realism is a philosophical stance that recognizes the potential existence of a reality beyond our knowledge or conscious experience (Bhaskar, 1979). Phillips (1987: 205) summarizes this stance as "the view that entities exist independently of being perceived, or independently of our theories about them." That some structures are only experienced through human action does not make these structures any less real – existing apart from humans and their perceptions – and the influence of structure is not dependent on individuals explicitly recognizing it (Fleetwood, 2005). As Ackroyd and Fleetwood (2000: 6) have noted, "Since our knowledge is bound up with our conceptions or even our discourse, it is easy to end up implicitly and illicitly concluding that all that exists are our concepts or our discourse."

One fundamental idea in critical realism that may, at the outset, concern students of technology and organizing, especially those with constructivist leanings, is the critical realist's invocation of the term "reality." However, critical realism does not suppose that there is one true reality out there waiting to be found. As Putnam (1999: 9) suggests:

> The notion that our words and life are constrained by a reality not of our own invention plays a deep role in our lives and is to be respected. The source of the puzzlement lies in the common philosophical error of supposing that the term "reality" must refer to a single superthing instead of looking at the ways in which we endlessly renegotiate – and are forced to renegotiate – our notion of reality as our language and our life develop.

This conceptualization of reality has strong parallels to symbolic interactionist thinking. As Herbert Blumer, who combined an ontological realism with an empirical constructivism (1969: 22) argued:

> the empirical necessarily exists always in the form of human pictures and conceptions of it. However, this does not shift "reality," as so many conclude, from the empirical world to the realm of imagery and conception... [This] position is untenable because the empirical world can "talk back" to our pictures of it or assertions about it — talk back in the sense of challenging and resisting, or not bending to, our images or conceptions of it.

Most critical realists hold that mental states and attributes (such as meanings and intentions), although not directly observable, are part of the real world. In other words, "while critical realism rejects the idea of 'multiple realities,' in the sense of independent and incommensurable worlds that are socially constructed by different individuals or societies, it is quite compatible with the idea that there are different valid perspectives on reality." (Maxwell, 2012: 9).

Applying this critical realist view to considerations of the structure-agency dialectic made famous by Giddens work on structuration theory, Margaret Archer (1995, 2000) developed what she has termed a "morphogenetic" approach to the study of structuration. Morphogenesis (which in Greek means "beginning of the shape") is a term from biology that describes how cells and organisms develop shape. Buckley (1967) applied the term to systems theory to explain the potential adaptability in social structures over time. The morphogenetic approach to critical realism is based on two analytical assumptions: (1) that structure logically predates the actions that transform it, and (2) that structural elaboration logically postdates those actions. Such a position leads to calls for researchers to enact an "analytical dualism" that treats structure and agency (those phenomena occurring in the realms of structure and action) as interacting while all the while remaining distinct from one another (Archer, 1995). In other words structures can be viewed as intransitive, or existing without an identifiable object at which they are directed (Archer, 2000). Within a morphogenetic approach to critical realism, structures can then be analyzed separately from the actions that bring them into existence, and sustain them through elaboration, reproduction, or transformation.

As this brief review intimates, and as Mutch's (this issue) more elaborate review demonstrates, there are some parallels between agential realism and critical realism. Both agree that there is a reality that exists apart from the humans that perceive it. Both also agree on the ontological nature of realism and they admit a tremendous amount of empirical constructivism. Where they sharply differ however, is in their conceptualization of interpenetration. As it concerns the social and the material, agential realism would argue that there is no ontological distinction between the two (hence the portmanteau "sociomaterial"): "To be entangled is not simply to be intertwined with another, as in the joining of separate entities, but to lack an independent, self-contained existence" (Barad, 2007: ix). By contrast, critical realism would argue that the social and the material are indeed separate entities that are put into relationship with one another and come to appear inseparable through human activity occurring over time. The main crux of the difference in theoretical foundation offered by agential realism and critical realism is that the former treats the "sociomaterial" as something that pre-exists people's perceptions of it while the latter argues that the "social" and the "material" are independent entities that become "sociomaterial" as they are put into relationship with one another through human action.

Mutch (this issue) suggests quite implicitly that this small but important difference of starting place may allow a critical realist foundation to forestall some of the problems presented by building a sociomaterial perspective built on an agential realist foundation. I would like to make this point more explicit. To do so, I will focus on the problems in the reverse order in which they are presented above. A description of how critical realism addresses the problems created by agential realism can be found in the two right-most columns in Table 1.

By acknowledging that the social and the material are *external* relations rather than *internal* relations – that one can exist without the other – critical realists can talk about a technology's "materiality" while agential realists cannot. To be clear, I define materiality as the arrangement of an artifact's physical and/or digital materials into particular forms that endure across differences in place and time. For "materiality" to exist as a concept separate from "sociomateriality" is to imply that there are some materials that are not simultaneously social (Leonardi, 2012b). The agential realist position would seem to deny this separation while the critical realist position would not. In the context of human-created artifacts such as information technologies the view that materiality is not necessarily social is a bit of a quagmire. Of course, all information technologies were created by people and are the result of social processes. But once those technologies have left the developers' hands and are implemented in particular organizational contexts, users experience a set of features that do certain things and do not do other things. Those things that it can and cannot do gain importance and are even perceivable because the people who use them have goals that they would like to use the technology to accomplish. In between the materiality of the technology and the socially formed goals of users is a perception of utility or impediment, of affordance or constraint. This view corresponds to the critical realist understanding that even people's perceptions of the "real" nature of the world should be considered real. In fact, it is a testament to the fixed nature of an artifact's materiality that the variability in perceptions of affordance or constraint that scholars capture is so small. People's perceptions of the technology are tied to its materiality, which pre-exists their use of the technology.

The important point here that critical realism sharpens (through the morphogenetic approach in particular) is that like any structural property, materiality predates the actions to which it will be put and the perceptions it will help create. Put more simply, users are introduced to a technology whose materiality has already been preconfigured for them. Although they may be able to change its materiality, even their perceptions of what changes could be made are constricted, to a large degree, by the initial materiality that they encounter when first using the technology. As Mutch (this issue: XX) suggests, critical realism's ability to treat materiality as distinct from and existing prior to the social context into which it will be placed helps to overcome the problem of "conflationism" that plagues the work of structuration theorists (especially those adopting a practice lens) who "elide the distinction between agency and structure" as well as agential realists who deny any distinction at all. From the vantage point of critical realism, "whereas materiality might be a property of a technology, sociomateriality represents that enactment of a particular set of activities that meld materiality with institutions, norms, discourses, and all other phenomena we typically define as 'social.'" (Leonardi, 2012b: 34). Materiality is one important building block of sociomateriality, but it is not isomorphic with the social. Rather, from a critical realist standpoint, those who use the term "sociomateriality" would likely argue that it is unique from the term "materiality" in that it shifts the unit of analysis from materials and forms to the development or use of

materials and forms. In other words, talking about sociomateriality is to recognize and always keep present to mind that materiality acts as a constitutive element of the social world, and vice versa.

A sociomaterial perspective resting on the foundation of critical realism also brings time into sharp relief. Mutch (this issue: XX) discusses this point succinctly: "all agency takes place in conditions that predate action, forming logics that condition and shape what is possible. Time is therefore important in our analyses as certain conditions are more enduring and resistant to change." The very notion that something existing in the structural realm – like materiality – predates (for a particular actor) anything occurring in the realm of action – like communication patterns or routines – implies a temporal analysis of the relationship between structure and action. The issue that Mutch dodges in his analysis, however, is how the material and the social are brought together in such a way to create the sociomaterial. Leonardi (2011) has advocated use of the metaphor of imbrication – the gradual overlapping and interlocking of distinct elements into a durable infrastructure – as one useful way to think about the process by which the social and the material become the sociomaterial. What is actually imbricated over time is social agency (which manifests itself in a groups' goals and intentions) and material agency (the things a technology can do that are not entirely under the control of users). Social and material agencies, though both capabilities for action, differ, phenomenologically with respect to intention.

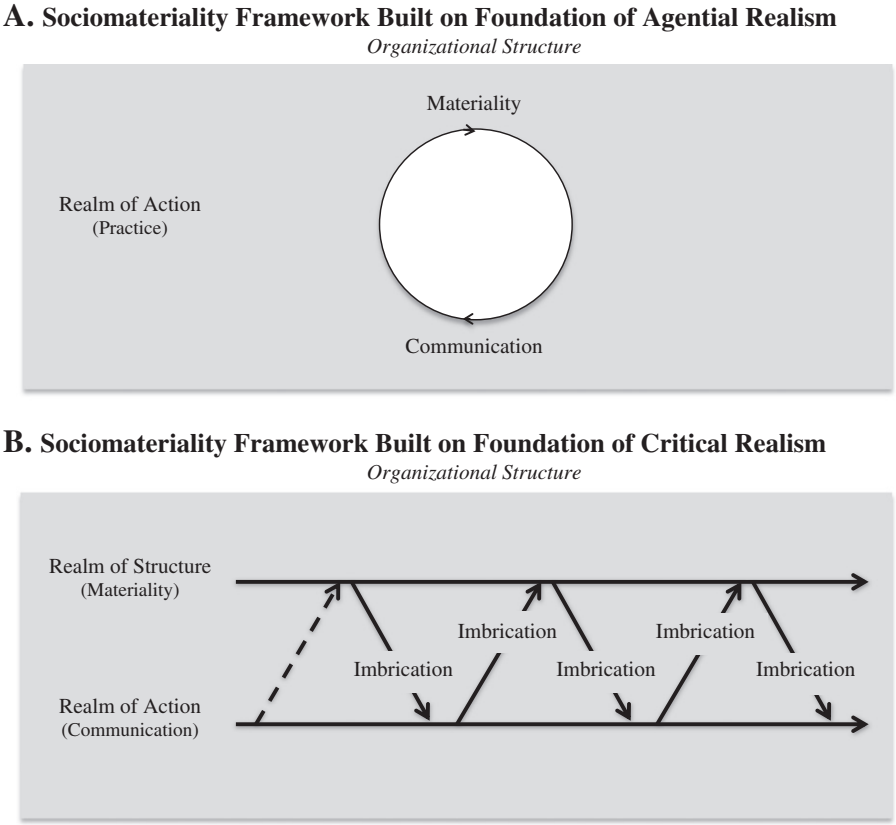
This view of agencies imbricating over time is wholly compatible with a critical realist perspective, which works to elucidate the nature of agency, because it is through the exercise of agency that action and structure are put into conversation (Archer, 2000). The recognition that one type of agency (material) is the property of something that exists in the realm of structure while another type of agency (social) exists in the realm of action is quite different than the agential realist view that "agencies are not attributes [of either humans or technologies] but ongoing reconfigurations of the world" (Barad, 2003: 818). Instead, it argues that the materiality of a technological artifact affords certain uses and actions. Although materiality, itself, transcends variations in space and time, those uses and actions can be different depending upon the context in which the materiality is used. For example, Microsoft Excel has many features that do not change across contexts (materiality). But those features do not automatically calculate modal values in a numerical list (material agency) until some user (with social agency) tells that materiality to do so. Even a simple physical technology like a hammer whose materiality (steel formed into a flat head and hook, fiberglass formed into a semi-cylinder, and rubber formed into a thin sheet) does not change can have many functions in that the same materiality can support driving nails into wood or holding papers down on a desk so they don't fly away. Whereas materiality refers to properties of the object, material agency refers to the way the object acts when humans provoke it. This distinction between materiality and material agency is akin to the distinction between the arrangement of physical or digital materials into particular forms – what I have called "materiality" – and what Kallinikos (2012) describes as "function" (what I suggest could alternatively be called "material agency"). What the technology *is* does not change across space and time, but what it *does* can and often changes. Function – or material agency – is a construction that depends, in part, on materiality but also depends on one's perceptions of whether materiality affords her the ability to achieve her goals or places a constraint upon her.

Materiality exists independent of people, but affordances and constraints do not. Because people come to materiality with diverse goals, they perceive a technology as affording distinct possibilities for action. The perceptions of what functions an artifact affords (or constrains) can change across different contexts even though the artifact's materiality does not (Faraj & Azad, 2012; Robey, Raymond, & Anderson, 2012). Similarly, people may perceive that a technology offers no affordances for action, perceiving instead that it constraints their ability to carry out their goals. In this view, affordances and constraints are constructed in the space between social and material agencies. Peoples' goals are formulated, to an important degree, by their perceptions of what a technology can or cannot do, just as those perceptions are shaped by people's goals. Depending on whether they perceive that a technology affords or constrains their goals, people make choices about how they will imbricate social and material agencies. Thus, while it makes sense to talk about material and social agencies as attributes that are activated in response to one another in the space of practice, it seems empirically inaccurate to say that agencies themselves are "reconfigurations of the world." Social and material agencies are distinct from one another, and it is only once they become imbricated in particular ways that they can then reconfigure technology's materiality and organizations' communication patterns.

From an agential realist foundation, in which temporality is ignored, and the organization, or the organizing out of which it is accomplished, has no start or end — the concern is with its *being*. Perhaps this is why agential realism has been used to talk about sociomaterial *practices*, or why authors like Orlikowski who developed a practice lens on technology use were drawn to agential realism as a footing for a sociomateriality perspective. A focus on practice assumes that organization can be found in the continuous flow of action occurring in everyday communication, or what Giddens (1984: 35) referred to as the "duree of daily life." The problem with grounding analysis of sociomateriality solely in practice (the realm of action), is that it lacks any consideration of the structural or material precursors to that action. As Reed (2010: 151) noted in his criticism of practice-based perspectives, "If 'organization is not an "it" but a becoming' (Taylor, 2009: 182), then we can ignore the it, because it does not exist and even if it did, it would have no bearing whatsoever on becoming." An agential realist stance on sociomateriality exacerbates the problem of being able to explain *why* certain actions occur when they do because it focuses so much on *how* certain actions are performed in practice. Consequently, it becomes difficult for the analyst to understand what role the sociomaterial plays in the constitution and perpetuation of organizations. By introducing time and by focusing on the process of the imbrication of agencies through it, the critical realist perspective provides better explanation of organizing as a process (rather than simply action) and, consequently, more points of articulation with extant theories of organization.

The fact that a perspective on sociomateriality footed on agential realism treats the sociomaterial as interpenetrated and as a coherent unit (the practice) means that researchers who use a sociomaterial lens cannot show how practices become sociomaterial; indeed, the ontology is that constitutive entanglement is simply the nature of any practice. Further, without a perspective that includes an explicit theory of time, it is difficult to demonstrate the process of interpenetration. When sociomateriality is footed on critical realism, researchers can ask the question about how sociomaterial practices emerge because the theoretical foundation posits that the social and material are separate and that they become entangled in a way that produces sociomaterial practices as people imbricate their agencies. As Mutch (this issue: XX) contends, "critical realism suggests that we live in a stratified world, where what is real at a particular level is the product of tendencies which it is the task of the analysts to explore, always with imperfect and provisional tools at hand." Thus when one adopts critical realism as a foundation for the study of sociomateriality they are directed to explain process and the ways in which the sociomateriality emerges and presents itself as indivisible, holistic, and a natural state of affairs. Consequently, analysts are given their methodological marching orders: explain how and why imbrication occurs, why certain practices come to take on the shape they do, and why people think those practices had to occur as they did. Here there are clear methodological implications. Researchers need to specify what they mean by "social" and "material." They need to present mechanisms by which imbrication occurs. They need to show the role actors play in the creation of the sociomaterial over time. And, they need to explore what actors do with a world that presents itself as though it were "sociomaterial". They also need to examine how people come to understand, interpret and deal with the materiality that pre-exists their interaction with technology and how this existing materiality becomes imbricated with the social contexts into which it is introduced. By fleshing out these processes, scholars will be in a strong position to be able to talk about the role that materiality plays in organizational life without resorting to deterministic thinking and without treating materiality as though it does not exist on its own. They will also be well poised to understand the role that materiality plays in the ongoing process of organizing and the constitution of organization over time.

Fig. 2 illustrates of some of the similarities and differences between an agential realist view and a critical realist view of sociomateriality based on the comparisons made above. In Panels A and B, the activity occurring within the gray square represents actions constitutive of broader organizational structure since, unlike the structurational perspectives illustrated in Fig. 1, organizational structure is not rendered in the realm of structure in a sociomaterial perspective. As shown in Panel A, agential realism suggests that sociomateriality is a phenomenon that occurs exclusively in the realm of action. A practice is constituted in equal parts and interactively by materiality of technology and the social context of its use. Thus, practices are inherently sociomaterial. Unlike those theories of technology based on structuration theory presented in Fig. 1, there is no structural realm. Rather, the realm of action is the locus of experience for people and the sociomaterial practice is, from moment to moment, itself the organization. In other words, the organizing process is nothing but a set of sociomaterial practices strung together because organization occurs only in practice (Cooren, 2010). As Taylor and Van Every (2000) suggest,



Note: In Panels A and B, the activity occurring within the gray square represents actions constitutive of broader organizational structure. In Panel B, horizontal arrows signify flows through time. Diagonal arrows signify actions' slow but cumulative entanglement with structure (and vice-versa) through the through the imbrication of material and social agencies. The dashed line represents imbrications that occurred before focal actor began using technology.

Fig. 2. Possible theoretical foundations for the conceptualization of sociomateriality.

practice is the site and surface of organization. It is thus difficult for studies of sociomateriality based on the foundation of agential realism to say anything about the process of organizing specifically. Because there is no realm of structure, practice is all that matters and organization is nothing but a reflection of practice.

By contrast, a critical realist perspective maintains an analytical dualism between the realms of structure and action. Here, materiality is thought to be a structural property while social interaction occurs in the realm of action. Over time, the material and the social become the sociomaterial through the process of imbrication and stay conjoined through continued imbrications. Although this model looks a good deal like the structurational models illustrated in Fig. 1, it is also quite different. Notice the transposition of the material and the social onto the poles of structure and action. Also, there are no vertical lines from structure to action. Instead, there are diagonal lines moving from action to structure and then from structure to action. These diagonal arrows signify actions' slow but cumulative entanglement with structure (and vice-versa) through the imbrication of material and social agencies. The dashed line represents imbrications that occurred before the focal actor began using technology. As the figure demonstrates, the realms of structure and action are distinct. They are not recursive, as they are in structuration theory, but they are interactive in that phenomena such as organizations are constituted at their confluence (represented by the gray box behind the figure). This is different than structuration theory's idea that organizations are best represented in the realm of structure. In this critical realist view,

people enter into the structuration process at a particular point in time. Although, conceptually, structuration may have no end or beginning, a specific person enters the process of structuration at a certain point in time.

In the critical realist view, people can only be present in the realm of action, but the realm of action into which they enter is enabled or constrained by structures that pre-exist them. As the dashed line in Panel B of Fig. 2 suggests, that structure is the product of past imbrication processes, but that fact matters little to the person who enters the process experiencing the full force of structure upon him. In the context of technology use, materiality pre-exists the social contexts into which it is put and though materiality may itself be socially constructed, people must contend with its form in the here-and-now as though it were an objective and unrelenting force. Certainly, they can choose how it is imbricated with social practice over time and it is this ongoing process of imbrication that constitutes organization. Thus, by keeping an analytical distinction between action and structure and by focusing on process over time, a perspective on sociomateriality based on the foundation of critical realism can perhaps say more about the constitution of organization than can be said when analyzed from an agential realist perspective, which maintains its focus on practice and simply assumes that an abstract notion of organization is merely the reflection of practice at a higher level of analysis.

4. Concluding remarks

Mutch (this issue) entitled his paper "Sociomateriality — Taking The Wrong Turning?" As the title suggests, he equates the sociomaterial perspective with agential realism and makes arguments for why agential realism is flawed. My argument is different than Mutch's argument in two important ways. First, I do not equate agential realism with sociomateriality. The sociomaterial perspective need not be built on one type of foundation only. Just as builders can choose to construct a house on either a slab-on-grade foundation or a raised foundation, so too can students of technology and organizing choose to construct their understanding of sociomateriality upon either an agential realist or a critical realist foundation. In home construction, the different foundations each have distinct benefits and drawbacks. Slab-on-grade foundations have superior insulation abilities, but they are prone to flooding and key utilities like water pipes are set within them and become inaccessible once the concrete is poured. Raised foundations allow continued access to utilities due to their elevated height and they have few problems with flooding or seepage, but they can be drafty and create a habitat for the growth of mold. Obviously, the choice of which foundation to lay under a house depends on which benefits are most important to the homeowner, and which drawbacks are least bothersome. The choice between theoretical foundations of agential realism and critical realism comes with similar tradeoffs. This is where I differ from Mutch in a second way. A theoretical foundation of agential realism is in no way a wrong turn, bad, or in any way worse than a foundation of critical realism. They are simply different and each one may be better suited for particular contextual circumstances. Because the virtues of agential realism for the study of sociomateriality have been extolled in great detail elsewhere by authors such as Orlikowski, I have followed Mutch's lead in this paper to not talk about its strengths here, but to use it instead as a foil to show the benefits of footing a sociomaterial perspective on one alternative foundation: critical realism. There are surely other foundations upon which the study of sociomateriality can be built that are not covered here.

In that spirit, Table 2 summarizes the similarities and differences between agential realist and critical realist foundations for the study of sociomateriality outlined above. As the comparison reveals, there are significant differences in practical application depending upon which theoretical foundation one chooses. Differences in the choice of foundation imply very real, practical differences in the operationalization of constructs, the use of research methods, the focus of empirical inquiry, and the types of conceptual contributions one is likely to be able to make.

As scholars who have contributed to the emerging literature on sociomateriality have surely recognized, and as casual readers of their writing know too well, discussions of sociomateriality have, to this point, remained highly philosophical. This tendency to be so ontologically-focused about the most practical of topics has led some critics to suggest that there is little practical value in a sociomaterial approach, and even less value in the language used to describe it (Sutton, 2010). Adding critical realism as second candidate for the theoretical foundations of a sociomaterial perspective surely runs the risk of amplifying philosophical discussion and making studies of sociomateriality less practically applicable. But

Table 2
Comparison of agential realism and critical realism for study of sociomateriality.

	Agential realism	Critical realism
General ontology	There is no separate social interaction that is not distinct from materiality — there *is* only a fused "sociomaterial"	The social context and the materiality that exist in it are separate. The social and the material *become* "sociomaterial" as people imbricate social and material agencies.
General epistemology	Analysts make arbitrary distinctions about what is "social" and what is "material" (agential cuts) when looking at a unified whole ("sociomaterial")	Analysts make determinations about how and why the separate "social" and "material" become the "sociomaterial" and persist that way over time.
What is materiality?	There is no materiality. There is only sociomateriality	The arrangement of an artifact's physical and/or digital materials into particular forms that endure across differences in place and time
What is social?	There is no social. There is only the sociomaterial	Abstract concepts such as norms, policies, communication patterns, etc.
What is sociomateriality?	The inherent inseparability between the material and the social.	Enactment of a particular set of activities that meld materiality with institutions, norms, discourses, and all other phenomena we typically define as "social."
What is the "practice"?	A sociomaterial accomplishment	The space in which social and material agencies become constitutively entangled through the process of imbrication
Methodological unit of analysis	The sociomaterial practice	Social and material agencies
Methodological focus	Identify what implications sociomaterial practices have for organizational processes (e.g. identification, negotiation, etc.)	Identify how the social and the material become the sociomaterial and what implications this has for organizing (e.g. communication networks, centralization, etc.)
Potential conceptual contributions	Showcase how all organizational processes are sociomaterial and how recognition of this fact can improve our theorizing about them. Demonstrate that organizing occurs in practice and that practice is neither social nor material; it is both.	Showcase how organizations and technologies come to be as they are and why people think they had to be that way. Move technology into a constitutive role in organizing and organizational processes while showing how organizing shapes technology

Mutch (this issue) is to be commended for initiating a comparison that puts into relief those very practical implications that differences in theoretical foundations imply. I have tried, in this paper, to extend Mutch's analysis to elucidate these differences and show how, depending upon the type of theoretical foundation one lays, he or she will build very different empirical studies, and consequently, make significantly different kinds of contributions to the study of sociomateriality. Thus, the implications of these philosophical comparisons are quite practical — much more practical than simple meditations on the ontological bases of either agential realism or critical realism alone. By making comparisons of this kind and exploring their value for understanding technology and organizing, scholars who examine the most practical of all phenomena may be able to find a path out of the interesting, important, and dense philosophical forest into the open fields of practical utility.

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