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Taking the ontological and materialist turns: Agential realism, representation theory, and accounting information systems

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ABSTRACT

Karen Barad's (2007) agential realism conceives the world as intra-acting agencies that take definite form only when an agential cut is made. In the information systems discipline, her theory underpins much of the work that goes under the rubric of sociomateriality. Importantly, her work challenges the validity of theories about the world based on representationalism and so-called Cartesian dualism. At least some scholars who subscribe to sociomateriality argue that one consequence of Barad's theory is that information systems theories such as representation theory stand on shaky grounds. I subject this proposition to scrutiny. I begin by summarizing the major tenets of representation theory and agential realism. Next, I use agential realism to provide an account of phenomena that are associated with an accounting information systems case study. I then evaluate the account, particularly from the perspective of what novel, innovative insights occur by using an agential realism lens. Compared to existing theories such as actor-network theory and general systems theory, I conclude that little new is learned. Moreover, I argue that representation theory provides an alternative, robust account of the case-study phenomena. I also consider the question of whether agential realism potentially provides accounting information systems scholars with a means of identifying the core of their field and constructing theories about any core they might identify.

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1. Introduction

For much of my academic career, I have pursued the idea that the essence of an information system is that it is a *representation* of another real-world system (e.g., Recker et al., 2019). Several years ago, however, some colleagues whom I greatly respect challenged my commitment to this idea. They pointed to narratives in the nascent (at that time) literature on sociomateriality that argued humans and information systems were now intertwined so inextricably that conceiving of information systems and humans as separate entities that interacted with each other was problematic (e.g., Orlikowski and Scott, 2008). They also pointed to Barad's (2007) work on "agential realism," which at least some proponents of sociomateriality argue undergirds their views about the nature of those parts of the world where human-created information systems are present (see Cecez-Kecmanovic et al., 2014, p. 812). Barad is a fierce, articulate, and compelling critic of "representational" and so-called Cartesian-dualist views of the world that supposedly ascribe sharp boundaries and properties to as well as causal structures among things in the world (e.g., Barad, 2007, pp. 46–59). In short, my colleagues essen-

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tially were arguing that my view of information systems as representations of real-world systems was based on a debunked, discredited, outdated philosophy about the nature of the world.

My response was to introduce two three-hour sessions on sociomateriality into a graduate information systems research-methods seminar I was teaching. I assigned a number of the seminal as well as some highly cited papers on sociomateriality as the compulsory readings for these sessions. I know that one of the best ways to learn about a topic is to engage in discussions on the topic with bright, highly motivated graduate students. The cut-and-thrust of graduate seminar debates is sure to test if one has a deep understanding of a topic.

Around the same time, I began work with Ting-Peng Liang to try to find a new theoretical lens that might be used to account for some of the findings he had obtained with neuroimaging devices when he studied human decision-making and judgement processes. We decided to try agential realism as our lens in the hope that we could produce novel theories and insights. By applying agential realism in a particular domain, we felt we would be forced to reach a deeper understanding of the nature of agential realism and its implications for the conduct of research. Thus, we commenced to read Barad's work in earnest—in particular, Barad (2007)—to try to assimilate her ideas into our work. After multiple readings of Barad's book, one outcome of our endeavors was a working paper that introduced agential realism for colleagues who were unfamiliar with Barad's work (Liang and Weber, 2019). In this paper, we sought to provide a more accessible overview of Barad's work, to critique the extent to which agential realism was internally consistent, and to canvass ways in which agential realism might be enacted by researchers.

In the sections below, I describe some reflections on my journey with agential realism. I hope these reflections will be useful for colleagues who have an interest in agential realism and its potential implications for accounting information systems (AIS). My conclusions also have implications for colleagues who are interested in the extent to which sociomateriality has implications for AIS. In a somewhat polemical vein, I reach some fairly strong conclusions about agential realism (and, by implication, sociomateriality). I hope some understanding of the context of my engagement with agential realism might provide some insights about why I reached these conclusions. I hope in particular that my reflections will provide a platform for debate and further discourse about the implications of agential realism (and sociomateriality) for AIS. For colleagues who hold alternative views to mine about the value of agential realism (and sociomateriality), I hope some points in my narrative below will provide a focus for contrary arguments that they wish to make.

The paper proceeds as follows. First, I provide an overview of representation theory. Second, I briefly describe the major elements of Barad's agential realism. Third, because Barad's narrative is often arcane, I present a case study that shows how agential realism might be used to frame some accounting-related phenomena. Fourth, I provide some reflections on the case study in terms of whether it produces any new, insightful outcomes. Fifth, I address the question of whether agential realism potentially enables AIS scholars to identify the core of their field[1] and to build theories about such a core (if indeed a core exists). Finally, I present some brief conclusions.

2. Overview of representation theory

The fundamental idea that underpins the representation-theory perspective of information systems is that information systems exist in nature or are created because they provide a cost-effective way, and sometimes the only way, to determine the states of or state changes that occur or have occurred in another real-world system that they represent. To the extent an information system faithfully depicts the real-world system it is intended to represent, representation theory predicts the information will be deemed to be more useful (Recker et al., 2019).

For example, consider the following eight scenarios:

- An online order-entry system provides a means for a company to determine the states of customers (the items they wish to purchase) without having to visit each customer in person to determine their needs. The system provides a representation of the state of each customer (their purchase intentions).
- A stock market system represents the trades that occur at a stock exchange because (a) the trades are initiated and occurring electronically and thus they are invisible to the human eye, and (b) even if the trades were visible, they are occurring so quickly that they would escape human attention and comprehension.
- A fixed assets system records the history of enhancements to, maintenance of, and depreciation of a company's fixed assets because over time some of these changes become invisible and/or disappear from human memory. The system represents the histories of the fixed assets.
- A daughter sends a "selfie" with a text message while she is travelling overseas. The photograph and text message provide a representation of the daughter's state that her parents would not otherwise be able to observe.
- A family's Facebook pages contains images, videos, and text provided by multiple family members. Each update provides a representation of some family member's state at a point in time (or events that have occurred).
- A politician uses Twitter to quickly disseminate their views on some matter to their followers. Each tweet provides a representation of the politician's cognitive state at a point in time.

[1] In this paper, I use the notion of a "field" as a component of a "discipline"—a subset of disciplinary activity that relates to particular types of phenomena within the discipline.

- A mechanical engineer builds a representation of a new car using computer-aided design (CAD) software. The software creates a representation of the engineer's cognitive state (their model of the car). The CAD representation then might be used with 3D printers to produce various components of the car.
- Autonomous vehicle software builds a representation of a real vehicle. It initiates and monitors changes to the state of the vehicle based on this representation.

The idea of information systems as representations holds even for some types of imagined worlds. For instance, a production planner may develop a simulation model to evaluate possible demand and supply outcomes that might arise under different market conditions. The market conditions are real in the sense that presumably they could occur, but they do not represent current reality and they may or may not represent a past or future reality. The information system that instantiates the simulation model is the means through which the production planner accesses these imagined worlds.

Similarly, a computer games developer may imagine a mystical world of witches, goblins, trolls, fairies, and so on. These entities are not real. Nonetheless, providing they have defined behaviors, the worlds in which they play a role can be simulated. The game software provides a representation of these mystical worlds, and the software is the means by which both the developer and those who play the game access these worlds.

In my research, I have sought answers to the question of how *humans* build better (more faithful) representations of stakeholder perceptions of real-world systems (Wand and Weber, 2017). In a world of machine learning and artificial intelligence, however, *computers* rather than humans are often the source of the representations (e.g., Baskerville et al., 2020; Faulkner and Runde, 2019). For instance, software has been developed to develop and refine customer profiles based on the billboards they drive past on a particular day at a particular time (determined via cell phone data) and their subsequent purchasing behavior (Friedman, 2016, pp. 53–54). The usefulness of these profiles depends on how faithfully they represent actual purchasing behaviour in which the customers engage.

Irrespective of whether humans or computers build the representations, I contend that representation theory still holds. Indeed, in an increasingly digitized world, Recker et al. (2020) argue that information systems representations become even more important because they *mediate* transitions between physical and digital realities. The representations provide *information* about another system. The usefulness of the representations depends on the quality of the information they provide about the other system.

3. Overview of agential realism

Agential realism is a philosophy developed by Karen Barad (2007) for understanding the world. It includes an ontology (what exists in the world), an epistemology (how knowledge arises and manifests in the world), and an axiology (ethical issues that the world entails). Barad argues these three components of her philosophy are "mutually implicated." In other words, they cannot be studied separately—they must be studied as a whole in the form of an "ethico-onto-epistem-ology." For expositional purposes, however, I present them separately in the subsections below (as she does to some extent in her book).

3.1. Ontology

The fundamental ontological element in Barad's philosophy is something that she calls "phenomena" (Barad, 2007, p. 141). Phenomena are not "things," nor "entities," nor "objects" that have defined properties, undergo changes of state (events), and interact with each other. Instead, they are:

- "dynamic topological reconfigurings/entanglements/relationalities/(re)articulations of the world" (Barad, 2007, p. 141).
- "the ontological inseparability of intra-acting[2] 'agencies'" (Barad, 2007, p. 139), where agencies are "not an attribute but the ongoing reconfigurings of the world" (Barad, 2007, p. 141).[3]
- "ontologically primitive relations—relations without preexisting relata" (Barad, 2007, p. 139).

The "inherent ontological (and semantic) indeterminancy" associated with phenomena are resolved via something called an "agential cut" (Barad, 2007, pp. 139–140). An agential cut is a particular type of "material discursive practice"—a practice that "materializes" (makes manifest) the world in a particular way. Agential cuts are enacted via "apparatuses," which are "*the material conditions of possibility and impossibility of mattering*" (Barad, 2007, p. 148).

Importantly, an agential cut produces the following outcomes:

- the *boundaries* of the components (relata) within the phenomena become definite.
- the *properties* of the components (relata) within the phenomena become definite.

[2] Barad contrasts "intra-action" with "interaction." Whereas the latter term refers to changes of state that occur to pre-existing things, the former term refers to how particular boundaries and properties of relata manifest only in the context of the specific relations among agencies.

[3] Barad's definition of "agency" seems incongruous because "of the world" implies that "the ongoing configurations" (agency) is in fact an attribute of something—namely, the world. Thus, Barad seemingly ascribes "agency" to the world in general but not to any part of the world.

- a *causal structure* among the components (relata) within the phenomena manifests within the phenomena, the *meaning* of the components (relata) and their relationships is determined.

To illustrate the above concepts, assume we are an accountant charged with the responsibility of calculating the environmental costs of emissions generated by a factory within our organization. Probably most, if not all, of us will begin to think about the factory and the different types of pollutants produced by the factory. If so, we have already done an agential cut. We have "materialized" the factory and the different types of pollutants from phenomena in the world. We will probably begin to articulate various properties of the factory and the different types of pollutant, relationships among the properties of the factory and the properties of the different types of pollutant, and even a causal structure between the operations of the factory the amounts of the different types of pollutant it produces. We are part of the apparatus that enacts the agential cut. How we enact the cut depends on the discursive practice we use. In part, we will be aware of the nature of the discursive practice of which we are a component, but some parts we will enact subconsciously. The way the apparatus enacts the agential cut will reflect our training and education, the influence of other employees, our culture, and so on.

3.2. Epistemology

For Barad, "knowing" is not about a sentient being acquiring new understandings of or making sense of the world. Instead, she has a *performative* perspective on "knowing." Specifically, "knowing" manifests in the world when one part of the world responds differently to a new materialization of the world. In other words, "knowing" is manifested in differential performance (Barad, 2007, p. 149).

Nor is "knowing" confined to sentient or living beings. For instance, a mountain responds differently to heat or cold and to wet or dry. The mountain "knows" how to respond to the vagaries of the phenomena of which it is a part. The differential performance of the mountain to varying climatic conditions manifests the mountain's "knowing" of its world.

Barad's concept of "knowing" also incorporates a notion of "objectivity" (consistent with her being a *realist*, albeit a particular type of realist). She relies on the work of the physicist, Niels Bohr, in proposing two requirements for objectivity (Barad, 2007, pp. 128–129). First, it must be possible to reproduce the results of an "experiment." Second, it must be possible to communicate unambiguously the results of a reproducible "experiment." If these two requirements can be satisfied, Barad deems that part of the world captured by the "experiment" to be "real."

When using the term "experiment," Barad does not mean the execution of research procedures in which treatments are manipulated, potentially confounding factors are controlled carefully, valid and reliable measurement instruments are used, data is analysed statistically, and so on. Instead, she means an apparatus (discursive practice) that enacts an agential cut that materializes the world in some way. Thus, reality exists when somehow agential cuts can be replicated and the world materialized in the same way.

Barad's epistemology also addresses the nature of measurement (Barad, 2007, pp. 175–176). Again, she relies on her notion of an agential cut. Recall, when an agential cut occurs, the boundaries and properties of relata within phenomena become determinate, a causal structure between the relata manifests, and the meanings of the components in the phenomena and their relationships become determinate. The resolution of these matters means "measuring agents" can be differentiated from "measured objects." The "measuring agencies" are "marked" by the "measured objects," and these marks are measures. Acts of measurement, therefore, are embedded within and contingent upon the agential cut that is made. Different agential cuts may materialize different measurements.

3.3. Axiology

Barad's axiology (ethics) is also framed in terms of agential cuts (Barad, 2007, pp. 392–393). Different agential cuts materialize the world in different ways. Certain worlds "appear,"' and other worlds do not "appear" (they are foreclosed). Barad argues that ethical considerations are inextricably bound to the agential cuts enacted as well as those that are *not* enacted. She comments: "Particular possibilities for (intra-)acting exist at every moment, and these changing possibilities entail an ethical obligation to intra-act responsibly in the world's becoming, to contest and rework what matters and what is excluded from mattering" (Barad, 2007, p. 178).

Because Barad is proposing a posthumanist philosophy, her axiology is not confined to humans. Thus, the agential cuts enacted by apparatuses that involve non-humans (other living things as well as non-living things) also entail ethical obligations. I suspect this notion of ethics will be troublesome for many scholars (myself included) because ethical considerations often are based on notions of free will and deliberate choice (rather than pre-determined actions and involuntary choice).

4. Applying agential realism: a case study

Barad's agential realism is deep and challenging, and it is also arcane. To provide a sense of how it might be used in the AIS domain, below I present a case study that is framed and interpreted using agential realism. I classify the case study as an AIS case study because it involves information systems that have been developed to represent a particular subset of properties of things in the real-world—namely, certain properties that characterize the economic value of the focal things.

The case study relates to a set of activities I undertook as a member of the board of a not-for-profit foundation. I was tasked with approaching Australian mining companies operating in Tanzania to seek their support for the construction of a women's ward at a remote hospital in Tanzania. The maternal and infant mortality rate in Tanzania is high. For a modest investment (but well beyond the capabilities of the local community), hospital staff estimated the ward would save the lives of over 100 mothers and new-borns annually.

At the outset, I knew little about mining companies nor their operations in Tanzania. Using a Web search engine, I first had to identify which Australian mining companies were operating in Tanzania. I then studied material on their web sites (e.g., the projects in which they were engaged, the makeup of their boards, and any community engagement activities they had undertaken), downloaded and read annual reports and quarterly and half-yearly activities reports, examined stock-exchange announcements, and so on. As part of my due diligence, I also searched more broadly for material about the companies to ensure they did not have tarnished reputations. For instance, I looked for evidence of human-rights abuses, damage to the environment, problematic safety records, and reports of corruption. I also had to learn the meaning of new terminology, such as "JORC-compliant" public reports (http://www.jorc.org/) and "definitive feasibility study." Politics also played a part, because I discovered that a number of mining companies were involved in major disputes with the Tanzanian government as a result of changes to laws that govern their operations in Tanzania.

Using an agential-realism lens to examine my actions, I was already making agential cuts prior to my engaging with the web to seek out information about Australian mining companies operating in Tanzania. As a result of these cuts, things *in* the phenomena were mining companies, Tanzania, hospitals, women's wards, pregnant women, newborns, birthing complications, etc. As I gathered more information, I assigned definite properties to these things and causal structures as I made further cuts. In Barad's terms, the "apparatuses" (discursive practices) of which I was a part were constantly materializing the world in different ways (configuring and reconfiguring).

For instance, for mining companies, some properties of interest to me were their financial position, their record of community engagement activities, their safety record, and any record of corruption. I progressively built a "picture" of each mining company in my mind as I read and interpreted each new piece of information. I also constructed causal structures—for instance, a mining company's record of community engagement as a predictor of likely support for the women's ward. In agential-realism terms, the world continued to materialize in different ways. Furthermore, the apparatus that I was using and in which I was embedded also kept changing. While seemingly Barad would assign agency to the agential cuts performed by the apparatus of which I was a part and not specifically to the information I was reading, in my view the information clearly had agency. It was my only means of building a picture of each mining company in my mind and, specifically, assessing the likelihood of whether it would support the women's ward project with funds that were not tainted.

What of intra-actions in the world I am describing? As an example, as best I can determine, I believe a "strong" reading of Barad would be that the mining companies and I did not pre-exist the relationship that materializes between us. Instead, we took form and changed in the agential cuts that were being enacted. In short, we emerged (materialized) from the amorphous soup called "phenomena."

For many colleagues, I suspect a claim that the mining companies and I did not pre-exist our intra-action will be one that beggars belief. These colleagues will surely point to the existence of the mining companies and me prior to our "intra-action." In response, perhaps Barad would argue that claims about these prior existences (materializations of the mining companies and me) simply reflect other agential cuts that have already been made. The materializations of the mining companies and me arising from these prior agential cuts are not the same as the materializations of the mining companies and me arising from the agential cuts associated with my efforts to raise funds for the women's ward. We are different entities in different phenomena (and different worlds).

A weaker notion of "intra-action" is provided by Bryant (2016, paragraph 10), who sees the notion of "intra-action" as implying that "beings" are "plastic": "A being is plastic if it is characterized as fundamentally alterable in form, qualities, and capacities." Under this interpretation of "intra-action," the mining companies and me are "beings" or "entities" whose characteristics (properties) are fungible. The mining companies and I take on properties via the agential cut made by the apparatus of which we are components. We take on different properties when we materialize under different agential cuts (e.g., an agential cut made by an investor, and an agential cut made by a PhD student whom I supervise). We are things that pre-exist the phenomena—we "enjoy some minimal autonomy from [our] relations, enabling [us] to migrate or enter into another set of relations" (Bryant, 2016, paragraph 37).

5. Some reflections on agential realism

What novel insights can agential realism provide us about phenomena that are the focus of AIS? Below, I first address this question by reflecting on the case study I described above. I then consider some broader issues that in my view bear on the usefulness of agential realism in general and ultimately, therefore, its potential worth in relation to AIS research.

5.1. Revisiting the case study

In my view, the case study I described above provides little support for the value of agential realism as a lens to explain the phenomena in which I was embedded (at least in the sense that agential realism provides new, innovative insights about the case-study phenomena).

First, I do not accept that the mining companies and I came into existence as a result of an agential cut. I know I existed before my engagement with the web to acquire information about the Australian mining companies that operated in Tanzania and then with some personnel in these mining companies (indeed, many people will attest to my prior existence!). Moreover, the mining companies had long been in operation before I began to investigate them (records exist to this effect). As I obtained information about the mining companies, I acquired properties (e.g., more knowledge about each of the companies) and lost properties (e.g., some of my preconceptions proved unfounded) and the value of some of my properties changed (e.g., my expectations about whether they would donate to the women's ward project). In short, my existence and the existence of the mining companies transcend the values of the properties we possessed as the agential cuts unfolded.

Second, longstanding theories can easily account for the phenomena of which the mining companies and I were a part. For instance:

- Actor-network theory (Latour, 2011; Mahama et al., 2016) could be used to show how the agency exercised by humans (e.g., mining company chief executive officers, pregnant women, Tanzanian government officials, myself) and non-human actors (e.g., mines, a remote hospital, ore deposits, climate) in the phenomena percolated through a network to achieve an outcome that was a likelihood assessment of a mining company donating to the women's ward project.
- General systems theory (e.g., Bunge, 1979) could be used to show how the various things in the phenomena (again, both human and non-human things) interacted systemically to achieve the donations likelihood assessment I made for each mining company.

Third, in my view, the agential-realism lens reveals nothing surprising nor insightful about the assessment processes in which I was engaged. For instance, the difficulties in sometimes assessing the financial position of some types of mining companies are well known. For anyone who has experience of fundraising, the difficulties of assessing a "prospect" and then converting the prospect to a donor are also well known. The processes I followed and difficulties I encountered were fairly typical of my experiences in other fundraising activities that I had conducted on behalf of my faculty as a one-time, senior university administrator.

Interestingly, in my due-diligence work, I was especially mindful of how much I was relying on *representations* of the mining companies to form my views about the mining companies. I was seeking to *create* a perception of each mining company I was investigating. I had no direct access to the companies (especially in the context of border closures arising from the COVID-19 pandemic). Instead, I had to rely on information to create a reality. Moreover, the information I used was a *representation* of someone else's reality. Thus, the quality of the reality I created depended in part on the quality of the representations I was using and the quality of the perceived and modelled reality that the information was representing (e.g., the reality represented by a JORC-compliant public report).

5.2. Some more general concerns about agential realism

Beside the above concerns in relation to the case study, I have three more general concerns with agential realism.

First, conceived as a theory, I contend that agential realism is untestable. Recall, agential realism hypothesizes that the world consists of *intra-acting agencies*. This might be so, but under agential realism I do not see how we can access the world except through an agential cut. Once a cut is made, however, we no longer have intra-acting agencies. Instead, the cut materializes *interacting things*—things that have definite properties (which include relationships with other things and a causal structure). As a researcher, I can therefore see no way to design an empirical test to show that intra-actions (as opposed to interactions) really exist in the world.

What, then, is value of the notion of "intra-action"? Perhaps it highlights the importance of the notion of a "reference frame"—recognizing that our conceptions of and measurements of real-world phenomena depend on the "location" from which we make our observations and enact our measurements (e.g., Bunge, 1977, pp. 119–123). Insofar as the notion of a reference frame has a long history in science, agential realism brings nothing new to the table. Nonetheless, perhaps with agential realism's focus on "apparatuses," we have a richer view of reference frames and the importance of and difficulties associated with defining them completely and precisely.

Second, I am a realist, which Bunge (2012, p. 1603) argues entails two beliefs: (a) that the world outside the observer exists independently of the observer (the ontological postulate); and (b) that over time the observer can acquire knowledge about this independent world (the epistemological postulate). Nonetheless, as a realist, I fully accept that answering the question of whether we ever have "true" knowledge of the world is fraught with problems. Instead, I accept that researchers build *models* of the world to represent their understanding of the phenomena they study. Over time, these models are refined and improved as our knowledge of the world increases. Over time, also, these models either gain acceptance among other researchers or they are eschewed. Furthermore, I recognize that many, if not all, research outcomes are "situated"—thus, the specific context in which they occur must be understood well. Thus, I am not a naïve realist; rather, I am a scientific realist.

As a realist, I am therefore not persuaded by the so-called "Copenhagen interpretation" of quantum phenomena, which forms much of the foundation for agential realism (Barad, 2007, pp. 66–70). I do *not* believe the world comes into being as a result of our observing the world via particular apparatuses. The world existed prior to "observers" existing, unless one argues that an "observer" was already present from the very beginning of the world.

Instead, I believe that apparatuses provide us with a particular lens on the world, albeit with varying levels of imperfection and interference in the observations they garner. I note with some relief, therefore, that several eminent philosophers of science (some of whom are well-trained in physics) now argue that the apparent anomalies of quantum phenomena (e.g., the absence of sharp properties and action at a distance) can still be understood from a realist perspective (e.g., Bunge, 2003b, 2012). I note, also, that some eminent physicists now argue that quantum anomalies can be understood from a realist perspective when microscopic quanta are conceived not as particles or waves but as fields (e.g., Hobson, 2017, 2018). From my realist perspective, notions such as "intra-acting agencies" and "agential cuts" have little appeal. Nonetheless, I continue to search for ways that such notions might inform my research.

Third, I doubt that theories developed to account for phenomena in the micro-world can account for macro-level phenomena such as organizational systems. In this regard, I am a systematist. I see the real world as a world of systems—composites of interacting things that have their own internal dynamics as well as dynamics that arise from their interactions with things in their environment. Importantly, they have a level structure of atomic components that interact to form subsystems, which in turn are components of higher-level systems, and these higher-level systems are then components of still higher-level systems. The higher-level systems have two types of properties: (a) *hereditary properties*, which are properties possessed by their components (subsystems or atomic components) (e.g., energy); and (b) *emergent properties*, which are properties possessed by the system only (and not its components) (e.g., the way in which a work team engages with accounting numbers to evaluate the economic viability of a project).

Bunge (2003a, p. 589) points out the problem of trying to use theories developed to account for the behavior of atomic components and lower-level systems as a means of accounting for the behavior of higher-level systems. To the extent the higher-level systems possess hereditary properties possessed by lower-level systems or atomic components, the theories might have some explanatory and predictive power (e.g., certain quantum properties hold at the micro-, mesa-, and macro-levels). The theories will be unable to account for those behaviors of higher-level systems that arise from the *emergent* properties they possess, however, because these behaviors are not manifested in the behaviors of atomic components or lower-level systems. Bunge (2003b, p. 457) illustrates this problem using Schrödinger's cat (a well-known example in quantum physics used to show one of the major paradoxes found in the quantum world): "Quantum mechanics does not hold for living beings, and not because these are macrophysical, but because they have properties that the theory ignores. In particular, the theory cannot explain why cats metabolize and reproduce, let alone why they like to hunt and purr."

6. Agential realism, representation theory, and the core of accounting information systems

Many years ago, I argued that the long-term survival of a discipline depends on the members of the discipline being able to (a) identify the core of their discipline (the phenomena that fundamentally characterize the discipline), and (b) develop a theory about the core phenomena such that other scholars would ascribe ownership of the theory to the discipline and not another discipline (the need for the discipline to have a "native" theory rather than rely on an "exotic" theory) (Weber, 1987). I still hold to this view, although I am well aware that the proposition that a discipline needs a native theory of its core phenomena to survive in the long term has been fiercely contested (e.g., Lyytinen and King, 2004; Weber, 2006). Nonetheless, seeking to articulate the nature of the core phenomena in the AIS field and the theories that might be used to account for such phenomena have been a concern of many eminent scholars in the AIS field (e.g., Debreceny, 2011; Liu and Vasarhelyi, 2014; Murthy and Wiggins, 1999; Poston and Grabski, 2000; Sutton, 1992, 1996; Vasarhelyi, 2012). These scholars have felt a need, too, to understand the fundamental nature of and to circumscribe the boundaries of the AIS field.

As AIS scholars, does agential realism offer the promise of assisting us to better identify the core phenomena of our field and to develop a native theory of these phenomena. I am sceptical that this outcome will occur, because I suspect the idea that a field (or discipline) has "core phenomena" would be anathema to scholars who advocate using agential realism as a way of conceiving the world. For a start, the notion of "phenomena" in agential realism differs from the notion of "phenomena" used more broadly in science. Recall, under agential realism, "phenomena" are a constantly moving soup of *intra-acting* agencies—relata *in* the phenomena with undefined boundaries, properties, and causal structures. It's unclear how such phenomena can even be named, much less identified as core phenomena. Only when an agential cut is made do the relata manifest with definite boundaries, properties, and causal structures. Perhaps if something common can be identified across all materializations of the world that are wrought by different agential cuts, this commonality might be a candidate for the core phenomena of the field. Furthermore, perhaps if something common can be identified across the agential cuts that evoke the commonality in the materializations, a native theory of the core might also become apparent. I suspect, however, that the commonalities to which I am alluding and agential realism will be unhappy bedfellows.

On the other hand, representation theory *does* provide candidates for (a) the core phenomena of the AIS field, and (b) a native theory of these phenomena. The core phenomena of the information systems discipline are the *representations* that are built of other things. The native theories that have been proposed try to predict and explain the characteristics of high-quality, faithful representations (see, e.g., Burton-Jones et al., 2017; Recker et al., 2019).

In the context of the AIS field, the core phenomena are representations of properties of things in the real-world that characterize the *economic value* of the focal things. Building such representations is often challenging, in the same way that building high-quality representations of other types of phenomena has proved challenging and thereby spawned other fields within the information systems discipline—for instance, health information systems (e.g., Sligo et al., 2017, pp. 89–90). These

higher-level systems—systems that are situated in particular application domains—have their own set of emergent properties that need to be understood and predicted. They require exotic, if not native, theories about information systems in the domains.

As the world becomes increasingly digitized, however, are these arguments likely to be sustained. Some scholars contend that information systems are now less about representations of reality because the information systems are creating rather than representing realities (e.g., Baskerville et al., 2020). From a general systems theory perspective, the appearance of increasingly sophisticated technology and human reliance on this technology manifests the evolution of simpler systems to more complex systems. The latter systems have greater capabilities for "performances" in the world than the former systems because the latter possess *emergent* properties—properties that are somehow related to the properties of their component systems but not possessed by any of the component systems. More complex systems also possess *hereditary* properties—properties that are also possessed by their component systems.

I contend that the representational property of an information system is a *hereditary* property. It will be possessed by *all* information systems, no matter what their level of complexity might be. If the representation property were not to be a hereditary property, some types of information systems would not possess it. Thus, it could not be a *core* property of an information system. Instead, it would be an *emergent* property—a property possessed by at least some higher-level, more complex information systems but not by the simpler information systems that are their components. In short, I cannot see that the core of a discipline can be found in emergent properties of the things that fall within the boundaries of the discipline. It must lie in a hereditary property possessed by all things within the boundary.

Representation theory deals with this hereditary property of an information system (a representation of some other world). As information systems evolve into more complex systems, however, identifying how this hereditary property manifests in these systems is an important line of research to pursue. For instance, as I indicated above, Recker et al. (2020) argue that the representations provided by more complex information systems increasingly play a *mediation* role to facilitate transitions between "physical realities" and "digital realities." The representation property is still present, but the things that possess it deploy it in new ways.

A second line of research is to focus on the *emergent* properties of more complex systems. What are the new properties that emerge in these systems? What is the nature of these new properties? What theories are needed to account for their values and changes of values? For instance, as humans increasingly rely on more complex, pervasive information systems in their daily lives, Baskerville et al. (2020, p. 519) argue that the relationship between humans and information systems changes from "sociotechnical" to "technosocial"—in other words, social actions are shaped increasingly by technology. If their predictions are correct, many interesting AIS issues arise—for instance, the extent to which the technology embodies ethical and legislative compliance considerations that potentially impact the users of accounting numbers. I predict that the theories that are used to account of these emergent properties are unlikely to be native theories, unless the higher-level systems that possess the emergent properties are conceived as the atomic components of still higher-level systems. Nonetheless, the fact that the theories are not native theories does *not* undermine their importance in understanding and predicting a wide range of AIS phenomena.

7. Conclusions

Over a long career as a scholar in the information systems discipline, I have continued to observe two broad approaches to the ways research is often done. At first glance, my explanation of the two approaches below might appear to indicate I have a somewhat jaundiced view of research. This is not the case; rather, I have found them useful as a way of understanding the nature of and motivations for particular types of research and the likely strengths and weaknesses of the research.

The first I will call the "wow" approach. It is characterized by scholars who are exuberant about new technologies and the phenomena they evoke and/or new theories that potentially provide novel insights into longstanding or emergent phenomena. The associated rhetoric often claims the extant research does not pay sufficient attention to the new phenomena, that existing theories are inadequate and should be discarded and replaced, and that the world has changed fundamentally as a result of new information technologies.

The second I will call the "sedate" approach. It is characterized by scholars who tend to be circumspect about claims that new information technologies have wrought fundamental changes in the world and that existing theories are deficient and therefore should be discarded. The associated narratives often manifest a search for ways in which existing theories might account for new information technology-related phenomena and to find what, if anything, remains stable in the face of the changes that have occurred.

Both approaches play an important role in the evolution of research in a field or discipline. Scholars who follow the first approach tend to be the bellwethers for recognizing important new phenomena. In my view, however, some are too keen to denigrate existing theories and to urge the adoption of new theories. A field or discipline that has constantly shifting sands of new theories risks its longevity. If it does not have a stable or at least slowly evolving theoretical core, it is often an easy target for assimilation in to other disciplines.

Scholars who follow the second approach tend to see through the hubris that often surrounds new technology and to ground and explain seemingly new phenomena in terms of longstanding concepts and theories. They provide stability for the field or discipline. The risk is they stay anchored to ideas and theories whose time has passed. Histories of science indi-

cate that in due course old paradigms have to be replaced because they no longer adequately account for the phenomena that is being observed (e.g., Kuhn, 1996). Recognizing the turning point is rarely easy.

I see agential realism currently being deployed by scholars who often follow the "wow" approach. I see representation theory deployed by scholars who often follow the "sedate" approach. On the one hand, perhaps mistakenly I see representation theory still provides important insights into the phenomena associated with an increasingly digitized world. On the other hand, my engagement with agential realism and reflections on its relevance for AIS have led me to a position of being especially circumspect about its value. To the extent research done under the rubric of sociomateriality is rooted in agential realism, my concerns also apply to this research genre.

I acknowledge that some agential-realism (and sociomateriality) narratives are elegant, exciting, provocative, and compelling, albeit often arcane. Nonetheless, the initial appeal of well-crafted narratives must always be treated cautiously. Ultimately, the advocates of any new way of conceiving the world must answer a fundamental question posed by Müller (2015, p. 37) when he reflected on the increasing use of Deleuze and Guattari (1987) notion of "assemblages" and Latour's (2011) notion of "actor networks" in the field of geography—specifically, he asks the simple but important question: "*What difference does it make?*" In this regard, we have to move beyond rhetoric and rhetorical sparring to produce materially different research outcomes that ultimately will inform practice.

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