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THE DIGITAL IS DIFFERENT: A REALIST REINTERPRETATION OF SOCIOMATERIALITY

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THE DIGITAL IS DIFFERENT: A REALIST REINTERPRETATION OF SOCIOMATERIALITY

Research paper

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Abstract

The relation between technologies and humans, and how digital technologies change the nature of this relation, are key theoretical issues underlying Information Systems research. Starting from a critical realist position, two questions are asked: First, what are the key characteristics of the difference between the traditional interaction between humans and technology, and the ways we deal with digital technology? Second, what can critical realism learn from strong sociomateriality in answering this question? I argue that critical realism should engage with strong sociomateriality, not by accepting its conception of reality, but by following its implications and empirical focus. Centering on the realist concept of emergence, I offer a reading that can account for many of the implications of strong sociomateriality. To explain how the digital is more tightly coupled to social phenomena than other types of technologies, the concept of transformational emergence is introduced to Information Systems literature. The argument is illustrated by a reanalysis of Scott and Orlikowski’s seminal study of TripAdvisor. The key argument is that the malleability of digital entities entails that they are disposed to transform by emergence, which is key to understanding the empirical inseparability between the social and the material in contemporary phenomena.

Keywords: Sociomateriality, Critical Realism, Emergence, Transformational Emergence.
1 Introduction

This paper examines the relation between technologies and humans, and how digital technologies change the nature of this relation, from the perspective of critical realism. Technology has always been integral to human life, but digital technology seems to tighten the coupling. Public discourse on some of society’s most pressing issues is produced by a mesh of human, automated and semi-automated agents, who are posting, cultivating and amplifying each other’s content on social media (Wired, 2018). Digital sensors and devices are increasingly mediating (Yoo, 2010) – and arguably shaping (Zuboff, 2019) - the interactions we have with other people and the environments that surround us. Human experience, and by extension the nature and fabric of society, are consequently being questioned (Harari, 2017). If agency is becoming inseparable from technologies, how can we hold on to notions of choice, humanism, and democracy? Such questions make it imperative to understand how humans and digital technologies relate, how this differs from the use of other types of technologies, and how the forces of such relations impinge on the world.

In the Information Systems (IS) field, the relation between humans and technologies has been a central philosophical problem for decades. In its contemporary iteration, the debate centers around sociomateriality, a concept introduced to the discipline by Orlikowski and Scott in the late 2000s (Orlikowski, 2007; Orlikowski and Scott, 2008). Sociomateriality was presented as an “umbrella term” covering theories and studies that emphasize the constitutive relationality of the social and the material. While people and artifacts are typically treated within Information Systems as interacting entities, they espoused an ontology that is “explicitly opposed to viewing the social and material as separate” (Scott and Orlikowski, 2013). Sociomateriality is, in other words, a theoretical perspective entailing that technology and humans, at least to a degree, can only be understood through their relations to each other.

The debate continues to receive considerable attention (Jones, 2014; Riemer and Johnston, 2017) and is dominated by scholars taking what Jones termed the strong and weak accounts of sociomateriality (Jones, 2014). The proponents of the “strong” side follow Scott and Orlikowski’s lead and offer accounts grounded on a processual and relational metaphysics (Cecez-Kecmanovic, 2016; Schultzze, 2017). Building their work on Barad and her theory of agential realism, which is based on an interpretation of quantum physics, the position “assumes that humans, technologies and things emerge through relations in practice: they do not pre-exist as entities (with given or interpreted properties and boundaries) but are instead created and continually recreated through relations” (Cecez-Kecmanovic, 2016, p. 48). As in the entangled parts of a quantum system, entities are not intrinsic to the world; they are rather produced in sociomaterial practices, processes that are simultaneously material and social. On the “weak” side, researchers advocating critical realism have been most vocal (Faulkner and Runde, 2012; Mutch, 2013). Keeping to the argument that the world exists of separate, but structurally intertwined, entities, they have tended to take artifacts and people as their starting points, and then study how these participate in structured and structuring processes.

Starting from a critical realist position, I concur with previous critique of strong sociomateriality, which has argued that the emphasis on inseparability between humans and technologies is both analytically and practically problematic (Leonardi 2012, Mutch 2013). However, something is missing in the critique; the distinction between social and material agencies is becoming increasingly blurred by digitalization, and a convincing conceptualization and analysis of the interplay between humans and digital technology is lacking. This leads to the motivation for writing this paper, which is summed up by two assumptions and their associated questions:

- First, there is a distinct difference between the traditional interaction between humans and technology, and the ways we deal with digital technology. Interacting with TripAdvisor is different from interacting with a violin. **What are the key characteristics of this difference?**

- Second, there is something unsatisfactory in both the strong and the weak sociomaterial positions. The strong sociomateriality position overstates ontological inseparability, while the critical realists fail to take into account the particular attributes of digital technology. To address
this: How can the ideas, empirical focus, and implications of strong sociomateriality be utilized to expand the critical realist account of digital phenomena?

To offer a critical realist basis for many of the implications – and empirical findings - of strong sociomateriality, I engage with emergence, the realist concept for wholes that are more than their parts due to their specific composition and interactions (Elder-Vass, 2011). While emergence is a well-established concept in critical realism (Bhaskar, 1998; Bygstad et al., 2016; Elder-Vass, 2017; Gorski, 2016; Lawson, 2016; Mingers and Standing, 2017), I offer a contribution by introducing the term transformational emergence into Information Systems theorizing. Building on the philosophy of Anjum and Mumford (Anjum and Mumford, 2017), I pose that the malleability of digital technologies entails that they transform as they interact with other entities and that this transformation causes the formation of the emergent assemblages they are part of.

Transformational emergence contributes to an understanding of why digital phenomena seem more entangled with human life than other types of structures of people and technology. A car-in-motion is an assemblage with emergent properties, in that the capacity to drive is neither reducible to car nor driver alone. The parts of this whole – the driver and the car - stay in most cases relatively stable as they form an assemblage, and the emergent capacity to drive is caused by the relations and interactions between them. In contrast, when digital phenomena interact with other entities, they tend to transform. For example, Facebook has a capacity to show potential voters advertisements that are targeted to their political inclinations, but this capacity can in no circumstance be reduced to Facebook’s digital infrastructure alone. It is caused by relational and transformational emergence. It is relational, as it is caused by a myriad of interactions of people and technologies. It is transformational, as the structure of data behind the voters’ Facebook feed – the Facebook Graph - is continuously changing through these interactions. In other words, I argue that emergence is more manifest in relations that include digital components than in other types of assemblages, and that transformational emergence lies behind many of the causal powers that shape contemporary society.

The paper is structured as follows: After a brief overview over prior critical realist engagement with strong sociomateriality and the question of separability/inseparability of technology and people, I discuss the concepts of relational emergence and sociomaterial assemblages. Building on these concepts, I develop, define, and discuss transformational emergence. I argue that the concept explains how the causal powers of digital systems change as the data changes. This theoretical contribution will then be illustrated by re-analysing the TripAdvisor case, studied by Scott and Orlikowski in their work espousing a sociomateriality based on agential realism (Orlikowski and Scott, 2015, 2014; Scott and Orlikowski, 2014). This choice of case is grounded in a reflective approach, as I seek to read their analysis and the theory of emergence against each other, to reach new theoretical insights. I conclude by discussing some of the implications of the theoretical contribution to the IS field.

2 Critical Realist Critique of Strong Sociomateriality and Ontological Inseparability

Ontological inseparability is central to the discussion on sociomateriality. The notion grew out of empirical research, where several studies showed difficulty in empirically separating what is social and from what is material in digital phenomena (Leonardi, 2012; Riemer and Johnston, 2017). Empirical inseparability led some to claim the need for a new ontology, a new understanding of the structure of reality. This move from observing empirical inseparability to claiming ontological inseparability questions whether people and technological agencies exist as separate entities, or whether they are instead effects of each other. As we will return to in section four, Scott and Orlikowski argued along these lines through several papers on their study of the social travel site TripAdvisor. They claimed that practices of anonymous travelers, of hoteliers managing hotels, and of receptionists handling guests, are all entangled intra-actions that together constitute what a guest, hotelier, and receptionist is and means (Orlikowski and Scott, 2015, 2014; Scott and Orlikowski, 2014).
Critical realism gained traction within IS almost concurrently as Scott and Orlikowski began articulating strong sociomateriality (Bygstad et al., 2016; Mingers et al., 2013; Orlikowski and Scott, 2008). As the proponents of both meta-theories seek to explain similar phenomena, but from distinctly different philosophical assumptions, it was perhaps inevitable that both they and those analyzing the debate from the outside would position the meta-theories in contrast to each other.

Jones was vital in conceptualizing the differences between them, terming the two positions as the strong and the weak accounts of sociomateriality (Jones, 2014). Following him, several scholars have aimed at explaining the two accounts by accentuating their contrasts. This literature can be divided into two streams. In the first, we find the pluralists, those comparing the two meta-theories and emphasizing the strength of having multiple theories. Leonardi, Jones, and Niemimaa are representatives of this stream (Jones, 2014; Leonardi, 2013; Niemimaa, 2016). They argue that diverging views on ontological inseparability are fruitful in generating multiple perspectives in research and for analyzing phenomena from different angles. This argument has also had resonance within those developing strong sociomateriality, who stress that the “world is always underdetermined by theory so that a multiplicity of perspectives is not only valuable but indispensable in helping us make sense of it” (Scott and Orlikowski, 2013, p. 80).

In the second stream, we find those who argue against the agential realist position from within critical realism. In this stream, Scott and Orlikowski’s work and choice of ontology have gotten a fair amount critique, most notably from Mutch (Mutch, 2013) and Faulkner and Runde (Faulkner and Runde, 2012). Mutch has two main arguments against the agential realist position: First, the empirical work building on strong sociomateriality tends to neglect the specificity of the systems involved. Second, it tends to have a localist approach, not dealing with broader social structures. Mutch attributes both problems to Barad’s theory of agential realism. Since entities and agencies get determined borders and properties through, and only through, specific apparatuses in agential cuts, studies tend to focus on the specific practices where they empirically observe that such cuts happen. According to Mutch, this hides the broader social structures and meanings which the practices are related to. Against this position, Mutch argues that critical realism interprets technologies as not continually determined in practice, but as quite stable entities with stable capacities. At the same time, social structures are inscribed into technologies, which are thus partaking in reproducing them. Critical realism will, according to Mutch, therefore guide the researcher into both studying the specificity of the technology and its wider structures.

Faulkner and Runde’s work is grounded on a social ontology where social positions, social rules, and social relations constitute what a social structure is (Faulkner and Runde, 2013, 2012). Their critique of agential realism centers around inseparability. They argue that there is a variety to how inseparable social positions are from each other, but that technological objects’ identities and functions are dependent on their social position. To take a classic example (not from their paper), the hammer’s identity and function are dependent on its relation to people building and things being built. However, inseparability of social positions is not the same as inseparability in the purely objective sense. The hammer exists as it lies unused in a cupboard; it even exists if all carpenters exclusively use nail guns. As they write, “technological objects qua objects exist in a way quite apart from the social position and technical identities, in the sense that, once they have been produced they form a part of the external world (and in most cases, would continue to do so even if all human observers were suddenly to disappear)” (Faulkner and Runde, 2012, p. 64). Faulkner and Runde thus argue that while social relations may constitute all relata in a social phenomenon, in that the footballer is constituted by the football and the football is constituted by the footballer, the footballer and football both exist as “brute” objects with physical properties outside of these relations (Faulkner and Runde, 2012).

Summing up, the critique against strong sociomateriality is that it disposes empirical studies to be localist and unspecific about technology and that it involves a conflation of the inseparability of social positions with the inseparability of “brute” objects. This critique has brought analytical clarity into the discussion, which is useful for both sides. However, it is not sufficient in explaining the empirical inseparability of contemporary digital phenomena that the strong sociomateriality seek to explain. Faulkner and Runde’s social ontology and Mutch’s inscriptions have undoubtedly great explanatory power in explaining a range of technological tools. However, I believe we need theoretical development within
critical realism to explain contemporary digital phenomena. And although I sympathize with the pluralists’ argument for multiple distinct meta-theories, I believe that critical realism within IS can and should be developed by engaging more constructively with the implications of strong sociomateriality. This moves us over to the relational theory of emergence, which is deeply rooted within the philosophy of critical realism.

3 Relational Emergence

To understand the relational theory of emergence, we need to start with the concept of causal powers. A power (or capacity) is generally taken to mean the ability to affect or change something in the environment (Mingers and Standing, 2017). The theory of powers is often contrasted to a positivist theory of causation. While the latter see causation as regularity between changes in atomic units, the theory of causal powers argues that causality is immanent; entities have their causal powers in themselves (Mumford and Anjum, 2011). There is something about glass that makes it prone to break if hit by a stone. Or to take an experiential example; if you play tennis, you exercise mental and physical powers to be able to swing the racket in a way that makes the ball go in a specific direction. Even though this experience does not account for external (or internal) causal powers that have created the dispositions for wanting to play tennis, or the physical mechanisms of a ball-trajectory-in-air, our experience of being agents in the world tells us that we can affect things outside of ourselves.

In the critical realist view, powers are generated by mechanisms: compositions and interactions between the parts of the thing that possesses the power (Elder-Vass, 2017, 2015). A computer is made up of components organized and interacting in a specific way, that produces the power to store data and execute instructions in it. A soldier is made up of person, gear, and gun, interacting in a way that produces the power to shoot-to-kill. Both the computer and the soldier are assemblages; they are made up of interacting entities (which themselves are assemblages down to the quantum level). An assemblage is thus a specific and relatively stable composition of entities. An assemblage’s causal structure is the totality of mechanisms constituting it, together with its resultant causal powers.

It should be noted that critical realist scholars tend to refer to structures and not assemblages. The rationale for using the latter is the ambiguity of the former term; it can refer to concepts as disparate as the totality of relations within a society, to a specific group of entities with specific properties (Elder-Vass, 2017, 2011; Porpora, 1989). The social theorist Elder-Vass argues that we need other terms for referring to the latter of these conceptualizations, which he refers to as social or socio-technical entities (Elder-Vass, 2017). To highlight that the phenomena under study are entities that consist of heterogeneous parts that hang together, I follow the sociomaterial tradition (and DeLanda (DeLanda, 2016) in using the assemblage concept.

<table>
<thead>
<tr>
<th>Concept</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Assemblage</td>
<td>A relatively stable composition of entities/assemblages</td>
</tr>
<tr>
<td>Emergent causal</td>
<td>A causal power existing in the assemblage, but not in its individual parts</td>
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<tr>
<td>power</td>
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<tr>
<td>Mechanism</td>
<td>The composition and interactions between the parts of an assemblage causing an emergent power</td>
</tr>
<tr>
<td>Causal structure</td>
<td>An assemblage’s mechanisms and causal powers</td>
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Table 1. Key Concepts for describing Relational Emergence
When an assemblage has properties and powers that only exist because of the composition and interactions of its parts (its mechanisms), it is termed as emergence. This means that the whole that is created by the composition of entities is something more than its individual parts. Although this must not be confused with the frequent use of emergence as a loose notion of something coming to be over time, an assemblage is naturally becoming, stable, and changing in a temporal sense of the word. To take the example of the University of Oslo, it is made up of students, professors, buildings, books, and so forth. It emerged temporally in the first part of the 19th century, and new features (like the capacity to educate online) continues to emerge over time. But more importantly for this argument, the university emerges structurally as the interactions between the students, professors, buildings, and books produce the power to educate in the specific way it does.

I follow Elder-Vass in describing this as a “non-mysterious” emergentist account of causal power (Elder-Vass, 2017). The soldier can shoot, the computer can compute, and the university can educate because they are composed of the parts they are composed of, that interact in the way they interact in. The textbook example of emergence is water and its causal power to put out fire. An explanation of this power must: a) either state that water has the power to put out fire or, b), state that the specific composition of H2O interacting in the way it does has the power to put out fire. Referring to water as a sum of Hydrogen and Oxygen can in no circumstances explain the power, as either of these atoms would instead make the fire fierier. The interactional composition between them is a necessity for explanation. The same goes for social structures. As Elder-Vass argues, you cannot explain a manager’s ability to fire his employee without referring either to the existence of an organization that contains them both or to the actual composition and interactions of the organization (Elder-Vass, 2011).

Until recently, the assemblages investigated in critical realist social science have primarily been characterized as social structures, that is, assemblages composed primarily of people interacting with each other. There has been less interest in technologies and other material entities and how they partake in emergence. As in other paradigms of social science, this interest is shifting. Elder-Vass has recently argued that most or all social structures and assemblages contain material entities (Elder-Vass, 2017) and that these entities matter in how they work and the powers they have. As already shown in the example of the computer and the soldier, it is not just the composition and interactions of people that make up an assemblage; it is also made up of the material entities within it. Elder-Vass exemplifies this with a quartet playing classical music (Elder-Vass, 2017). A quartet is an assemblage of people and instruments organized in a specific way that together create harmonious music. There is no way of explaining the output of the type of harmonious music specific to quartets without either referring to the quartet as having immanent powers or to the musicians and instruments and the composition of relations between them. There are, in other words, necessary spatial and interactional relations between players, between player and instrument, and between instrument and instrument for the quartet’s causal powers to exist. This theoretical movement towards a priori symmetry between material and human agency is crucial. It means that technologies are not merely tools utilized in social structures and assemblages, but active parts in the emergence of them.
Figure 1. A quartet assemblage: a causal structure with the capacity to produce quartet music. M with arrows denotes mechanisms that produce a causal capacity. Each player with instrument, i.e. a player-instrument assemblage, can cause music. These assemblages interacting together can cause quartet music.

As illustrated in figure 1, the basis for harmonious music is an inseparable assemblage of people and instruments. It is not inseparable in the sense that musician or violin does not exist outside of the assemblage, but it the sense that neither quartet nor music would exist if it had not been for musicians and instruments interacting in the way they did. If we accept that quartet music is real, we must also accept quartet assemblages as being real.

4 Transformational Emergence

In the quartet, specific causal powers of the instruments are being triggered as they partake in the overall assemblage, but neither their powers nor their other qualities change substantially because of the emergent whole (although they get tuned before use and worn over time). Emergence, however, can also entail transformations in the constituent parts of an emergent assemblage.

A transformation entails a qualitative change in the properties or causal powers of an entity. If an entity is transformed because it is constituent to an emergent assemblage, it can be termed transformational emergence. Such transformations can happen in the process of forming the assemblage or as an effect of the assemblage’s emergent powers (akin to downwards causation in Mingers and Standing, 2017). Returning to the textbook example mentioned above, the philosophers Mumford and Anjum exemplify transformational emergence with water: “A hydrogen atom has a vacant space on its outer shell of electrons and an oxygen atom has two vacant spaces. When they have bonded, they can be understood as sharing electrons, thereby completing the outer shells of all the atoms – two of them being hydrogen – which thereby forms a stable molecule. The three ‘parts’ have thus each changed in order to form the whole” (Anjum and Mumford, 2017, p. 98).

Mumford and Anjum argue that all emergence, not just of water, must be explained by transformations. An interaction means that the causal power of one entity acts with the causal power of another entity. If disposed to it, interactions between these entities do not just entail a mutual triggering of the parts’ respective powers, but transformations in them. Emergence can thus be explained as interactions causing transformations that lead to new powers. For example, languages exist because people exercise their linguistic abilities in interactions with each other. However, a specific language, like English, exist as a living language because its users have developed the ability to speak and write in the English language. The emergent existence of a language structure is thus the result of transformations in its users’ causal powers. Put in other words, if the “circuits” of your brains did not transform through interactions with English-speakers during upbringing or education, it would be hard to explain why you could read this text, or how the English language could exist at all.
I do not follow Mumford and Anjum’s argument that emergence necessarily entails transformations in all constituent parts. In the quartet example, the human constituents have transformed to be able to play in exact coordination, while the instruments have been tuned to be in harmony with each other. However, we do not attribute the causal power of the quartet primarily to these prior transformations. It is their combined composition and interactions that are necessary for the emergent causal structure of the quartet to exist. This leaves the relational theory of emergence as sufficient to explain it. However, I propose that transformations are essential to understand the type of empirical cases strong sociomateriality is known for. Explaining such simultaneously social and digital phenomena requires a theory of emergence which is both relational and transformational.

While the violin can be separated from the quartet, digital systems cannot be equally separated from the assemblages they are part of. Empirically they are intertwined, ontologically this is explainable by transformational emergence. I will show this through a thought experiment, which envisions an image sentiment recognizer. This is a software system for recognizing images showing positive content. For example, an image depicting children playing in the sun could be a candidate for positive labelling by the system.

The software system has two modes: a learning mode and a recognition mode. While in learning mode, a set of images labeled as showing positive content is fed into the system and used to train a machine learning model. After training is complete, the system enters recognition mode. In this mode, the system takes a random image as input, uses the trained model to match for patterns, and displays a binary output on a screen denoting whether it has recognized an image with positive content or not. The screen also displays a button. Two people sit by this screen, and every time a new output is displayed, they discuss whether the input image has positive content or not and compare their judgment to the recognizers’ output. If they reach a consensus that the system has produced a false negative - an image containing positive content has not been recognized as such - one of them presses the button. If the button is pressed, the image is added to the original training data set, and the system enters learning mode. The new data set is now used as input to retrain the model. As this process iterates, the system becomes more and more reliable at recognizing images which these two people find positive. We can also imagine that after some time discussing image after image, their taste for what is positive content is also changing, which contributes to the choices they make in deciding what a positive image is.

![Diagram](https://via.placeholder.com/150)

**Figure 2.** Thought experiment. The stable mechanisms of an image-recognizer-users-assemblage are causing the transformational emergence of a causal power.

This thought experiment depicts an emergent assemblage, composed of a system and people interacting in a way that produces the system’s causal power to recognize images with positive content. The recognition system itself has stable mechanisms: given training data, it is disposed to recognize patterns in images. *But initially, it does not have the causal power to recognize positive content; this only comes as*
this power transforms through the emergence of the assemblage. If you were to place the trained system in another context with other people, it would be less apt at recognizing images these people find positive. Its causal power and its meaningful relevance are in other words tied to the assemblage. This contrasts with the example of the quartet: while the position of a violin in a web of meaningful relations, or its role in producing harmonious music, is produced in an assemblage, the causal powers of the separate violin is quite stable. The vibration of the violin’s strings causes oscillations in the air around it, interpreted by humans as sound, whether it is part of a larger assemblage or not. However, the digital modules responsible for performing sentiment recognition would not be able to produce meaningful output outside of the overall assemblage, as it transforms through interactions in order to do what it does. Thus, theoretically, transformational emergence is defined as the becoming and existence of wholes that are more than their parts, due to transformations in the parts caused by the composition and interactions between them.

5 Causing Ratings: Reanalysis of the TripAdvisor Case

To apply the theory of relational and transformational emergence on an empirical case, we have reanalysed Scott and Orlikowski’s seminal work on TripAdvisor. In a series of papers, the two authors reported from their comparative analysis of two organizational schemes for producing hotel reviews and ratings: the British Automobile Association (AA) and TripAdvisor. By doing this study, the authors could compare knowledge production in digital social-media platforms to “more longstanding ones in the hospital sector” (Scott and Orlikowski, 2014, p. 15). Representing the latter, AA has a long tradition of reviewing and rating hotels and restaurants using professional inspectors, who base their work on relatively stable routines and standards set by the association. In contrast, reviews and ratings in TripAdvisor are produced in an amalgam of people and algorithms, where routines are dynamically changed and enacted over time. This comparison allows the authors to show how specific relationships between the material and the social produce very different meanings and knowledges, which in turn produce very different reviewers, hospitality services, and market dynamics.

My reanalysis commenced with reviewing Scott and Orlikowski’s joint authorship, ending up with a concentrated effort into their papers on service, valuation, and anonymity (Orlikowski and Scott, 2015, 2014; Scott and Orlikowski, 2014). There were two reasons for focusing on this work. First, Scott and Orlikowski are central to the strong sociomaterial movement and their studies are paradigmatic to its stream of literature. Second, in expanding critical realist theory of the digital, I wanted to take the empirical focus and implications of strong sociomateriality seriously. Critical realists in the IS field have not been convinced by the analytical lens employed in the Scott and Orlikowski’s papers, but their findings and implications are important and should be explainable using a critical realist perspective. For Scott and Orlikowski convincingly show how specific configurations of people and technologies produce specific types of reviews and ratings, and in doing this, these configurations are shaping the hospitality industry.

Building on the theoretical underpinnings of Barad, Scott and Orlikowski argue against prior conceptualizations of service, valuation, and anonymity, by explaining them as phenomena that do not exist as fixed things nor as fixed meanings before activity, but rather as continuously performed through practices. Central to all three papers are the specific rankings and reviews produced in the digital system of TripAdvisor. According to Scott and Orlikowski’s analysis, ratings are entangled with the anonymous or pseudonymous practices of TripAdvisor contributors as well as the various practices found in hospitality services. The ratings and the connected practices are constitutive to the algorithmic evaluation that occurs in TripAdvisor; they are organized material-discursive practices that entangle “algorithmic computations with continuous contributions of volatile consumer content posted by a distributed, anonymous crowd “(Orlikowski and Scott, 2014, p. 887). Furthermore, this apparatus produces “multiple, ongoing responses by hoteliers, characterized by heightened anxiety and activity that permeates conditions on the ground” (Orlikowski and Scott, 2014, p. 887). Ratings have, in other words, performative implications for the agencies of hospitality.
I follow the argument of Scott and Orlikowski, but my interpretation is different. To develop the argument, I build on transformational emergence, as described above, and the critical realist principle of retrodiction. A critical realist analysis typically follows methodological steps originally formulated by Bhaskar: Identification of the significant features of a case to explain, retrodiction to possible causes, i.e. abductively inferring what causal powers exist that can explain the empirical existence of those features, and identification of mechanisms that produce these causal powers (Bhaskar, 1998). Following Scott and Orlikowski’s lead, the production of ratings in TripAdvisor is the most significant feature to explain. Retrodiction leads us next to the immediate cause of rating: the digital system of TripAdvisor and its causal power to generate reviews and rankings displayed to users. A digital system consists of stored data that are executed and executed upon, causing new data to be stored and displayed. The mechanism in TripAdvisor can, therefore, be simplified as interactions between algorithms and data. This interaction produces daily ratings of hotels (TripAdvisor Insights, 2018), which are retrieved and displayed when users interact with the site. By the same mechanisms, every user interaction probably has an impact on the ratings, as TripAdvisor can utilize usage data as signals in its production of updated ratings.

Identifying the mechanisms internal to the digital system is, however, not a sufficient explanation of how the ratings are produced. In the reflective reading, I explicitly want to follow Scott and Orlikowski’s case analysis and what they emphasize as significant, as I want to explain the type of inseparability they have identified. Scott and Orlikowski show through their empirical description how the ratings are produced by a number of actors and a number of actions. In a vignette, they describe the traveller “Molly”, the hotel “Somerton Hotel”, the hotel manager “Carl”, and the receptionist “Mandy”. They show how Molly reads TripAdvisor content when she chooses which hotel to travel to, how she relates to other travelers through the system, how Carl reacts to TripAdvisor postings, and how he communicates with Mandy based on it (Orlikowski and Scott, 2015, p. 14). As Molly is nudged by TripAdvisor through gamification and reminders to review Somerton Hotel, her resultant review of is not merely a result of her inner taste, but is based on the embodied interactions with the hotel as a building, with the people that staff it, with the expectations she got from TripAdvisor in the first place, and with the affordances of the digital systems, constraining her to rate the hotel on a given scale. The causal power of rating can in other words not be separated from all these social and material activities.

By mapping out these actions and actors, we find a composition of different entities (people, technologies, hotels) that interact in a certain way over time. As illustrated in a high-level manner in figure 3, the mechanisms within TripAdvisor’s digital systems, consisting of interactions between algorithms and data, have the capacity to calculate the output rating for a specific hotel. This capacity partakes in mechanisms involving the visitors’ capacity to visit a hotel, write a review based on this visit, and so forth. We see an emergent assemblage with a causal structure of mechanisms and powers. For the power to rate cannot be separated from the assemblage, and the assemblage cannot be separated from its mechanisms (the interactions of hoteliers, visitors, system, etc). In other words, emergence entails that the power to rate in this specific way would not exist if it had not been for this specific causal structure.
Having identified the emergent structure behind the causal power to rate, we are nevertheless pushed forward by Scott and Orlikowski’s analysis. For what about the entities within the structure? Isn’t the very agency of Mandy, the hotel receptionist, formed by the emergent TripAdvisor structure? I propose that this question is resolved by the concept of transformational emergence. Rating is not only a causal power that produces reviews and rankings as signs on a screen, it also changes the very parts of the causal structure that has produced it. For example, in Orlikowski and Scott’s paper, we find a description of a new practice acted out in hotels, of hotel staff daily checking the TripAdvisor site to read the latest reviews and rankings (Orlikowski and Scott, 2014). Why has this new practice developed? Significant causal powers in the TripAdvisor structure are the daily calculation of hotel rankings, the continuous publishing of reviews, the traveler’s ability to plan his travels based on the ratings, and the hotel manager’s ability to know and respond to what potential guests are reading about her hotel. These powers all dispose towards the performance of the new practice. And recursively, the practice is one of the mechanisms behind the emergent structure in question. Mandy the receptionist is not left unmarked by the emergence, as she worries about negative reviews. The structure has caused a change in her embodied mental state, which may dispose her to change her agency (exercising her causal powers in the world). But the structure does not determine her agency; neither can it entirely explain it. Mandy, of course, is much more than her worries.

If we return to the immediate cause of reviews and ratings, the digital system’s causal power to display ratings is explainable by causal transformations. The mechanism within the digital system that produces ratings is, as described, quite stable; an interaction between data executed (algorithms) and data stored. The specific ratings, however, change from day to day. One day, hotel Savoy is rated at the top for one specific city, the next hotel Bristol takes its place. But does this change of rating constitute a change in the systems’ causal power? Are we discussing the power to produce hotel ratings, or the power to produce specific hotel ratings? I argue that both are real causal powers. To understand this, we can compare TripAdvisor to the thought experiment from the section above. As proposed in the transformational theory of emergence, the causal powers of the constituent parts of TripAdvisor are not just exercised in specific ways; they are continuously transformed by the interactions of the total assemblage. The causal powers of a digital system change as its data changes. TripAdvisor’s data is produced in the interactions of hotels, guests, and digital system. The power to sort one hotel from another hotel is thus similar to the image recognizer, in that it transforms as part of the emergent structure. Through the relatively enduring mechanisms of the larger assemblage (practices of travellers, hotels, hoteliers, TripAdvisor), the
data in the digital system is continuously changing, causing continuous transformations in the causal power to sort specific hotels, which again causes transformations in the assemblage it is part of, in that a negative review can cause a worried receptionist.

6 Discussion and Conclusion

Is entanglement an apt description of the inseparability of causal powers, digital system, and structure in the TripAdvisor case? Taking entanglement seriously entails that there are no such things as separate entities, in that there are no boundaries, no properties and no agency outside of the structure (Barad, 2007). In other words, inseparability as entanglement would mean that the practices and ratings are in the same (not analogous) type of relation as a scientific apparatus and the spin of a photon in a physics experiment.

Critical realism can support neither strict process metaphysics nor interpretations of quantum physics as analogy or ontology of the world on the macroscopic level. As argued by others professing to this philosophical position in Information Systems, relatively stable entities extending the local are necessary for explanation. Not because entities have a hidden esoteric essence, but because entities are assemblages with relatively stable causal structures that enable and constrain their agency in relation to other entities. The world exists of both substance and process, and I would argue that accepting the existence of both provides a more valuable ground for substantive theory.

Orlikowski and Scott end their discussion of valuations with a call for more research: “The extensive and uncertain organizational implications of sector-wide shifts from formulaic to algorithmic apparatus suggest that multiple further studies are warranted to continue investigating the emerging phenomenon of online valuations” (Orlikowski and Scott, 2014, p. 889). In other words, they are asking: what happens to valuation as whole sectors get digitalized? To study such shifts, entities are not just linguistically convenient in a representationalist discourse. If a shift is happening across a sector, there is something extending across it, something that is not purely situational. This provides a rational for following critical realism in studying mechanisms and structures. Mechanisms, the composition and interactions of the parts of an assemblage, are enabled by the capacities of the entities that partake in them. Because digital systems consist of immanent mechanisms, data stored and executed, they are disposed towards some causal powers and not others. These causal powers enable and constrain which type of interactions they can have with other entities, which, in turn, enable and constrain which causal powers an emergent digitalized assemblage can have.

In the introduction, two questions were asked: First, what is the key difference between non-digital and digital technology in their interactions with humans? Second, how can the ideas, empirical focus, and implications of strong sociomateriality be utilized to expand the critical realist account of digital phenomena? Taking the second question first, strong sociomaterial studies demonstrate that the line between the technical and the social is increasingly blurred by digitalization. In critical realist terms, I have argued that the causal power of rating hotels in TripAdvisor is not a property of the digital system nor of the traveler, but of the structure they constitute together. Critical realist theory on affordances has argued along the same lines, explaining affordances as causal structures of people and technologies that enable and constrain activity (Bygstad et al., 2016). By engaging with strong sociomateriality, I have taken this a step further. I have accentuated that the traveler and the system are not easily separated, as they are entities that transform by interacting in the structure.

Sociomaterial assemblages are structures of human and material parts, with emergent causal powers. Some assemblages are partly constituted by digital modules. These modules transform as data from interactions in the overall structure are added to them. Neither the overall causal power of the assemblage nor the transformed powers of the transformed digital parts can be separated from the whole: the powers would simply not exist if the whole did not exist. By accepting this realness of emergent powers and that these powers are dependent on the whole, I would argue that there is an aspect of inseparability between the digital and the social. Critical realist researchers in IS, therefore, need to pay more heed to the implications of strong sociomaterial studies. The strength of staying within the critical realist
paradigm is that it enables a study of how the entanglement between the social and the technical has come into being, by investigating relatively durable mechanisms and how relations and transformed powers come together. In other words, it allows an examination of the assemblage part by part and an understanding of the depth of an emergent whole. I would also argue, as Mutch has (Mutch, 2013), that such accounts can fit into an experiential understanding of the world, making the objects of our studies less, instead of more, mystical by our theories.

In earlier critical realist studies, technology has been seen as inscribing or mediating social structures (Mutch, 2013, 2009), there has been a focus on discrete entities and their powers and properties (Mutch, 2013), and objects have been seen as mostly stable outside of their social positions (Faulkner and Runde, 2012). I argue that emergence, in both its relational and transformational conceptualization, is key to further develop a critical realist approach to understanding societal and organizational developments as the digital and the social is becoming increasingly intertwined. The “brute” objects of the digital realm are not as stable as the objects of the physical realm; they are malleable objects that have a potent potential for being transformed in relations with other objects and people.

The emphasis on change leads to an attempt at answering the first question: what is the key difference between non-digital and digital technology in their interactions with humans? The argument in this paper is that a key difference between the digital and the non-digital is as follows: the causal powers of structures involving technology are typically explainable by relational emergence. In contrast, structures involving digital technology tend to be formed by transformational emergence, which is defined above as the becoming and existence of wholes that are more than their parts, due to transformations in the parts caused by the composition and interactions between them. Interactions of humans and technology have caused emergent causal powers long before homo sapiens became sapiens. A person and a sharpened stone have different abilities than a person alone. What is special about the digital is therefore not this type of emergence, but that the causal powers of digital systems transform and become what they are by partaking in larger assemblages. By sharpening, the possible causal powers of the stone are shaped before action. In contrast, the causal powers of digital systems are shaped in action by transformations in data, caused by interactions with other entities. The person-stone assemblage’s capacities might change over time, the stone gets worn and the person gets skilled, but digitalized assemblages are radically more dependent on transformations for their powers to be what they are. Because their causal powers change as their data changes, digital systems are disposed towards transformational emergence. As the spread of machine learning systems accentuates this disposition, I hope this paper will start a wider exploration of what transformational emergence means for both theory and practice.

References


