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Doing Sociomateriality Research in Information Systems

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Abstract

This paper agrees with Mueller et al.'s (2016) view that researchers who want to adopt a sociomaterial approach often find themselves confused regarding research methods. However, it departs from Mueller's et al. suggestion to seek guidance from the structural-functionalist approach of Parsons' and Shils' (1951) General Theory of Action. The paper argues that finding a methodological framework for research following a sociomaterial approach has to be consistent with the philosophy, ontology and roots of this approach and that it is limiting to read the post-human approach of sociomateriality through a structural-functionalist lens. The paper briefly reviews the roots of the sociomaterial approach in sociology and information systems and offers a methodological guidance based on Actor Network Theory (ANT) and post ANT/Feminist lenses.

Keywords: Sociomateriality, Actor Network Theory, agential realism, research methodology.

ACM Categories: J.4, K.2, K.6.0, K.4.0

Introduction

In their paper, Mueller et al. (2016) highlight the methodological uncertainty IS researchers experience when doing research based on the 'sociomateriality' thinking (Mueller et al. 2016). They then offer methodological guidance based on Parsons and Shils' (1951) general theory of action (Parsons and Shils 1951a).

I agree with Mueller's et al stance that many scholars have expressed concerns when adopting the sociomateriality approach regarding their data collection and analysis methods. However, I voice concerns regarding seeking methodological guidance from social theories that are fundamentally different from the sociomateriality approach in terms of ontology and philosophical orientation. While the sociomateriality approach is based on post-humanist thinking, Parsons' and Shils' (1951) is based on structural-functionalist thinking. These are nearly contradictory approaches. Structural-functionalist thinking focuses on the social structure, norms and objective functions. It conceptualizes non-humans as mere objects to be acted upon. In contrast, post-humanist thinking recognizes and emphasizes the role played by non-human actors in interactions. Indeed, blending contradictory philosophical thinking or applying one to serve the other loses the depth of both approaches resulting in shallow analysis. Therefore, I argue that the methodological uncertainty surrounding the sociomateriality approach cannot be resolved by departing from the sociomaterial thinking and adopting a significantly different sociological and philosophical thinking as Mueller's et al suggest. To resolve this issue, it is important to consider the biography of the sociomateriality approach and its origin in the information systems discipline and the reference discipline of Sociology. In this paper, I offer an overview of such a background and its methodological implications.

The paper is organized as follows. The following section (section 2) offers a brief overview of the sociotechnical roots in information systems research. Section 3 reviews the background and roots of the sociomaterial thinking in information systems research. Section 4 clarifies some of the methodological issues related to the application of the Sociomateriality approach, the methodological implications of Actor Network Theory (ANT) and post ANT/feminist thinking. Section 5 provides a short conclusion to the paper.

The sociotechnical roots in IS research

The relationship between the social and the technical aspects in organizations has been the concern of IS research since the very early days of the sociotechnical approach (Trist and Bamforth 1951). In their seminal and founding work, Trist and Bamforth (1951) examined the disputed –at that time- semi-mechanical method of coal mining named the "longwall method" (consisting of mechanical conveyors and coal-cutters) which replaced a manual method named "hand-got method".

Their study provided a very comprehensive and detailed analysis of the longwall method and how it was changing group structures, interactions and individual roles resulting in the emergence of new forms of organization. Moreover, they analyzed the attitude, emotions and psychological state of employees and the different coping strategies that emerged. They regarded the 'advanced' longwall method (at the time) "as a technological system … and as a social structure consisting of the occupational roles that have been institutionalized in its use. These interactive technological and sociological patterns [were] assumed to exist as forces having psychological effects in the life-space of the face-workers, who must either take a role and perform a task in the system they compose or abandon his attempt to work at the coal-face." (Trist and Bamforth 1951, p. 5 - as in original). They concluded "it was impossible for the method to develop as a technological system without bringing into existence a work relationship structure radically different from that associated with hand-got procedure" (ibid, p. 9). This significant study became a founding stone in the crafting of the sociotechnical paradigm in information systems research.

Regarding research methods, Trist and Bamforth (1951) provided in-depth comprehensive analysis that included diverse technological, social and emotional aspects. They included an analysis of the longwall method, the work structure and organization, the groups' dynamics and interactions, and workers' emotions and attitudes, and they analyzed the emergence of the relationship between them over the two years of the study.

Kuhn (1970, p. 175) defines the paradigm as "the entire constellation of beliefs, values, techniques, and so on, shared by members of a given (scientific) community". In this context, over the years and through the work of many scholars, "much IS research has grown up around *sociotechnical* topics [emphasis added]..." (Chiasson and Davidson 2005, p. 399) forming the sociotechnical paradigm in IS research. This paradigm "underlies much of IS research where the human and the technical must each be considered …" (Beath et al. 2013, p. iii).

The sociomaterial roots in IS research

The sociotechnical approach was initially grounded in systems thinking and was mainly focused on organizations and work design, human relations, emotions and attitudes. It aimed to understand and find possible combinations of all these aspects that could achieve both efficiency and people's satisfaction (Mumford 1966; Mumford 1976; Mumford and Banks 1967). The sociotechnical approach maintains a broad definition of the technical to include information systems, machinery, plant layout, raw materials among many others. It advocates that "as technology becomes more complex, so does human nature." (Cooper and Foster 1971, p. 473) and hence "any production system requires both a technology –machinery, plant layout, raw materials—and a work-relationship structure that relates the human operators both to the technology and to each other. The technology makes demands and places limits on the type of possible work structure, while the work structure itself has social and psychological properties that generate their own unique requirements with regard to the task to be done" (ibid p. 467).

As the information systems field developed and grew, its theoretical foundation went well beyond the systems thinking of the sociotechnical approach to include diverse theories from different reference disciplines (Baskerville and Myers 2002). This diversity of theoretical grounding enriched the sociotechnical approach in the information systems field and arguably made it more specific to the information systems field. One of the main reference disciplines that informed the sociotechnical thinking in information systems is sociology. Different branches of Sociology have informed the IS field for decades, including Science and Technology Studies (STS), and feminist studies to name a few.

The term 'sociomaterial' has been used in sociology in STS and feminist studies post Actor Network Theory (ANT) through the situated action work of Lucy Suchman (Suchman 2002; Suchman 2003; Suchman 2006; Suchman et al. 2002) and feminist work of Anne Marie Mol (Mol 1999; Mol 2002; Mol and Berg 1998). In 2007, Orlikowski introduced the concept to the Management discipline's community in an attempt to highlight to the Management discipline the importance of technology as an integral part of most levels of organizing (Orlikowski 2007). In 2008, Orlikowski and Scott challenged the organization studies and management discipline arguing that while "technology seems to be everywhere in the world of practice", "technology is largely absent from the world of organizing" in organizational research (Orlikowski and Scott 2008, p. 434). They examined four leading journals in the field of management namely; The Academy of Management

Journal (AMJ), The Academy of Management Review (AMR), Administrative Science Quarterly (ASQ) and found that only 4.9% directly addressed the role and impact of technology in organizations. They warned the management discipline that "to the extent that the management literature continues to overlook the ways in which organizing is critically bound up with material forms and spaces, our understanding of organizational life will remain limited at best, and misleading at worst" (ibid, 466).

It is important to note that in this article, Orlikowski and Scott (2008) introduced "sociomateriality" as an "umbrella term" and explicitly state that "The most *prominent body of literature that we are organizing under the umbrella term of sociomateriality belongs to Actor Network Theory (ANT)*, originally developed by sociologists Michel Callon (1986) and Bruno Latour (1987)" (Orlikowski and Scott 2008, p. 456) [emphasis added].

In 2009, Scott and Orlikowski (2009) published a working paper of their first empirical work in the information systems field. In this research, they note: "The key ideas of a sociomaterial perspective are still emerging but some interesting and provocative directions have begun to appear (Barad 2003, 2007; Introna 2008; Suchman 2007)." In this paper, they turned to Barad (2007) and in particular her articulation of the notion of the apparatus (Scott and Orlikowski 2009, p. 5). Their following work (Orlikowski and Scott 2013; Scott and Orlikowski 2012; Scott and Orlikowski 2014) has been more influenced by post ANT/feminist thinking of Barad's known as Agential Realism (Barad 2007).

Orlikowski's and with Scott publications served as catalysts for the adoption of the term in organization studies and the IS field. Jones (2014) reviewed 140 journal articles in organization studies and information systems using the term, "sociomateriality", and found that the "great majority appearing after 2007" and mostly cite Orlikowski's work (Jones 2014, p. 895-896) showing the influence of this work on organization studies and IS field. However, a closer look at these journal articles shows that out of those papers reviewed, only 31 appears in IS journals and contains empirical work. This demonstrates that the application of the 'Sociomateriality' approach is in its infancy and emerging and that there is room for interpretation and innovation.

The brief history of Sociomateriality in this section highlights that Orlikowski and Scott (2008, p. 456) explicitly announced ANT to be "The most prominent body of literature …[they] are organizing under the umbrella term of sociomateriality". However, in their later work, they started to experiment with and apply post ANT/Feminist ideas of Agential Realism.

The General Theory of Action

The classic theory of Parsons' and Shils' (1951) is undeniably important in contemporary sociology. It is an edited volume that was originally published in 1951 and since then had many printing and editions (Parsons and Shils 1951c). It had the ambition of organizing the social sciences under one umbrella and producing a grand theory of action (Smelser 2001). It is positivistic in nature and is based on systems thinking (Bailey 1990, p. 63-67). It advocates that action is structured through three main systems; namely personality, social and culture systems. In addition to the central role of these systems, it also maintains that an individual in action "must make" series of five choices "before the meaning of a situation is determinate for him, and thus before he can act with respect to that situation" (Parsons and Shils 1951c, p. 76-77). It was criticized for reducing human dynamism to a simple typology - two-by-two type of tables- (Parsons et al. 1953, p. 130) and for its grand ambition to produce a prescription of human behavior based on structural-functionalist approach of sociology (Swatos Jr 2010). While detailed review of the theory is beyond the scope of this paper, it is relevant to highlight here that the General Theory of Action did not address technology or provide any socio-technical treatment of technology and that it is fundamentally different in its ontology and philosophy from any of the sociomateriality lenses discussed here. On the contrary, according to this theory, technology is a physical object that does not act or interact with the human actor. Parsons and Shils present the theory as consisting of "a class of social objects (individuals and collectivities) and a class of nonsocial (physical and cultural) objects." (Parsons and Shils 1951b, p.5 and p. 57). Nonsocial objects are defined as "any objects which are not actors") and are called "physical" as they do not interact with "the actor-subject as other actors do; and . . . constitute only objects, not subjects, of cognitive, cathectic and evaluative orientation." However, when nonsocial objects have the additional property of being produced through interaction they are called "cultural." Examples of cultural objects are laws, ideas, and recipes (Parsons and Shils 1951b, p. 57 and elaborated in ; Swanson 1953, p. 127).

The theoretical approach of sociomateriality adopted in the information systems field is mainly rooted in science and technology studies (STS), Actor Network Theory (ANT) and post ANT/feminist work. A methodological guidance for research following this approach has to be consistent with its roots and philosophy. In the following section, I provide some of the methodological implications of adopting the

sociomateriality's most established lens namely; ANT and relate them to the newer lens of sociomateriality namely; Agential Realism.

Sociomateriality: methodological clarification

The previous section shows that Actor Network Theory (ANT) and post ANT/feminist theory are two possible lenses for the sociomateriality approach. The aim of this section is to clarify some of the methodological implications related to the application of the sociomateriality approach based on ANT and relate them to the lens of Agential Realism. It also contrasts them with the premises of the General Theory of Action in response to Muller et al. (2016).

ANT has been widely adopted in the information systems (IS) discipline since 1990s. Its philosophical stance and methods of inquiry are seen to facilitate its practical application, as well as having much to offer IS researchers (Hirschheim 1992; Walsham 1993; Weick 1984). IS researchers adopted it to study IS implementation (Lee and Brown 1994), design and development of IS (Elbanna 2009b; Lilley 1998; McGrath 2001; Vidgen and McMaster 1996), project management (Elbanna 2010), infrastructure evolution and development (Atkinson 2000; Bloomfield et al. 1997; Klischewski 2000) and notions of IS success and failure (Cecez-Kecmanovic et al. 2014; Elbanna 2013). Hence, it is reasonable to seek methodological guidance from its long history of development and application without ignoring the post ANT/feminist development.

It is acknowledged here that there are ontological differences between ANT and Agential realism regarding the properties and existence of human and non-human. These differences could be understood as revolving around the ontological strength of non-human actors and could be referred to as "weak sociomateriality" and "strong sociomateriality" for ANT and Agential Realism respectively (Jones 2014). Critique of the sociomaterial approach is out of the scope of this paper. Readers can find critique of Sociomateriality in (Faulkner and Runde 2012; Kautz and Jensen 2013; Leonardi 2013; Leonardi et al. 2012; Mutch 2013) as well as critique of ANT in (Bloor 1999; Collins and Yearley 1992a; Collins and Yearley 1992b; Schaffer 1991) as well as other published papers and books. However, in this section, I only focus on the methodological issues related to conducting sociomaterial research and propose guidance based on ANT and post ANT/feminist thinking strands as follows.

Commitment to heterogeneity

ANT renders agency to both humans and non-humans and hence adopts the notion of actors or actants from semiotics (Aanestad and Hanseth 2000; Hanseth and Braa 1998; Hanseth and Monteiro 1997). Accordingly, an actor could be any entity, human or non-human, involved in a series of actions. Actors are tied together in a certain network through intermediaries. Intermediaries then represent the relationship or transaction that passes between actors or what ties them together. In this regard, "action is simply not a property of humans but of an association of actants" (Callon 1987, p. 93; Latour 1999, p. 182; Law 1992, pg. 93).

This view of material heterogeneity suggests a discourse of "liberal democracy", as it "grants the right of representation to anything - anything at all" (Akrich 1992; Bloomfield and Vurdubakis 1997). Applying ANT, researchers find that there is "nothing which cannot be brought into the fold" (ibid). Agential Realism is also committed to heterogeneity of materials. Therefore, from a methodological perspective, applying any of the lenses of Sociomateriality; ANT or Agential Realism, would require researchers to commit to material heterogeneity and finding different humans and non-humans involved in the phenomenon under investigation.

In contrast, Parson and Shils (1951) provide a functionalist perspective that focuses on human behavior in situations. For them, action is a human behavior "oriented to the attainment of ends in situations, by means of the normatively regulated expenditure of energy" (Parsons and Shils, p. 53). They maintain that "the frame of reference of action involves actors, a situation of action, and the orientation of the actor to that situation" (Parsons and Shils, p. 56) emphasizing that action is 'normatively regulated'. They do not grant agency to objects and they only account for cultural aspects. Following from Parsons and Shils' reasoning, non-humans are either "physical" objects that do not interfere in the situation of action or cultural such as culture, norms, ethics, and social values that interact with humans and could impact their decision making. From a methodological perspective, a researcher following Parsons and Shils's Theory of Action should be following humans, properties of situations (social and cultural), and orientation to action (motivational and value orientation, ibid p. 58-60). Therefore, an IS researcher following this theory will not be able to take technology seriously and account for the role of technology in the analysis. At best, a researcher can produce a simplistic social deterministic account of the technological phenomenon under examination as we can see from Mueller et al's (2016) illustrative example.

Actantial roles as an empirical matter

The ANT lens provides a process and interactionist view of the relationship between technology and society. It is largely empirical and avoids any a priori assumption about either the social or the technical. It maintains that the social and the technical are in constant dialogue and negotiation, and considers the settlement of each negotiation as an empirical matter and an achievement. For example, ANT does not deny the possible political power of technology but leaves it to the social to negotiate this power. The lens itself is open to accept any stance that 'people in the field' accepts. This stance is strikingly in opposition to Parsons and Shils (1951) theoretical stance of granting actantial roles only to human actors and considering non-social object – such as technology- as physical objects (Parsons and Shils 1951b, p. 57).

Furthermore, ANT holds a symmetrical analytical stance of the human and non-human. Callon and Latour (1992) explain that their "empirical program does not claim either that humans and artifacts are exactly the same or that they are radically different", and that they leave the question of agency open. They argue that the redistribution of "actantial roles" are themselves subject to negotiation, and thus subject to empirical evidence rather than a priori determination. They argue that it is a matter of empirical evidence to follow the fact builders (scientists, technologists) on their work of constructing these competences. Callon and Latour (1992) also demonstrate that a priori attribution would not only be a methodological mistake but worse, in their opinion, a serious error of political judgment "since differences are so visible, what needs to be understood is their construction, their transformations, their remarkable variety and mobility, in order to substitute a multiplicity of little local divides for one great divide" (Callon and Latour 1992, p. 356).

This perspective of the empirical resolution of the "actantial roles" or agency in practice has also been adopted in Barad's Agential Realism. Barad advocates "not merely a symmetrical accounting of influence between the natural sciences and political economy, but a model of analysis that isn't a Newtonian instrument" based on "the Newtonian belief in the prior existence of separately determinate bounded and propertied entities and practices" (Barad 2007, p. 231). It is recognized here that Barad's relational ontology is different than ANT ontology. While Barad focuses on and argues for the empirical resolution of the properties of entities (Barad, 2007, p. 139), ANT argues for the empirical resolution of their relationship. However, from a methodological point of view, whether IS researchers address sociomateriality through ANT lens or through Agential Realism lens, they need not to impose any a priori view on the role played by the social and the technical, and their effect on each other. They need to keep the actantial roles open as empirical matters decided upon by the actors in the field.

In sum, the General Theory of Action holds humanistic views where agency is considered to be the property of humans. Therefore, the actantial role as discussed above is not an issue of concern or discussion for this theory since action is only granted for humans.

Closure and stability

The influence of the social and the implications of the technical are issues for negotiation in ANT, not a starting point of the research, since this lens moves beyond the typical dichotomy of essentialist-relativist to provide a contingent performative view of the relationship between technology and society. It considers stability as being negotiated and hence a continuous process of aligning interests. Hence, there is no closure for once and forever and, in principle, the network could break down at any point (Jones 2014, p. 895-896).

ANT recognizes that sociotechnical networks could be inscribed in machines, technical devices, texts, documents, and training materials (Cadili and Whitley 2005; Hanseth and Braa 1998). It also acknowledges the social description that takes place once the technology network is opened, negotiated, and reconstructed. Furthermore, importantly, its notion of punctualization - that is reducing the infinitely complex world to a set of entities that are well defined, instead of dealing with the whole networks of the world[1]- allows the technology to be sometimes nodded in a wider sociotechnical network. At the same time, it does not deny that this node is not always well perceived and taken for granted. Thus, it considers that the node could be opened in case of controversy to reveal its once invisible network. This view maintains ANT stance that there is no essentiality either on the technology or society side.

While closure and stability are achieved temporarily in ANT through negotiation and inscription, it is achieved in Agential Realism through 'Agential Cut'. In agential Realism, "… *phenomena are the ontological inseparability/entanglement of intra-acting "agencies"*. That is, phenomena are ontologically primitive relations-relations without preexisting relata." (Barad 2007, p. 139) [emphasis as original]. Intra-action in agential realism implies that there is no pre-existing entities and that "through specific agential intra-actions that the boundaries and properties of the components of phenomena become determinate …" (ibid, p. 139). The agential cut is what separates subject and object and emerges through intra-action. The agential cut "enacts a resolution within the phenomenon of the inherent ontological …indeterminacy." (ibid, p. 140) [emphasis as

[1] A punctualized actor is itself a network that was successfully translated and aligned.

original]. Therefore, in Agential Realism, the influence of the social and the implications of the technical are not issues for negotiation as in ANT but are the resolution of their agential separability. They are empirical matters that occur in their intra-action. This particular notion of inseparability and the empirical agential cut that presents a methodological difficulty when applying the sociomateriality approach based on Agential Realism lens. This empirical and ontological difficulty cannot be resolved through the General Theory of Action -as Mueller at al. (2016) suggest since the latter holds significantly different ontological views of entities as pre-existing and separate. General Theory of Action is a functionalist humanistic theory that position humans in the center of action and only recognizes non-social objects such as culture, norms and history that interact with humans while overlooked other objects the it calls "physical".

Analytical Blackboxing

In ANT, action is a property of the association of actants; humans and non-humans (Callon 1987, p. 93; Law 1992, p. 93); Latour, 1999, p. 182). The responsibility of action "must be shared among the various actants" (ibid). This view could be a methodological burden for researchers. A researcher could continue to deconstruct and unfold every action to an endless number of actors and networks not knowing where to stop and how far the deconstruction should go. Latour (1999) offers a methodological solution to this problem that he called 'black boxing'. Black boxing consists of following the actors in the construction of their network, de-compose what they negotiate and compose, and accept and take for granted what they take for granted. The 'black boxing' of entities in this way reduces the complexity of analysis to a manageable level by treating an internally complex network only through its simpler external interfaces (Elbanna 2009a). Following the method of 'black boxing', a researcher needs to follow the associations and disassociations wherever they are produced (Latour 1987; Latour 1988; Latour 1996; Law and Callon 1988) and analytically understands the logic behind black boxing some actors while decomposing others.

The ANT methodology of 'following the actors' differs from "studying ego's actions" based on the General Theory of Action. General Action Theory follows only social actors and their interactions with cultural objects. While it does not offer a methodological guidance in this regard and was criticized for its abstract conceptualization of action (Swanson 1953), it should be noted that the General Theory of Action also did not consider non-cultural objects. Therefore, its premises are fundamentally different from the post-humanist view of sociomateriality. Hence seeking methodological guidance from the General Theory of Action is less than productive for sociomaterial research.

Conclusion

There is a need for methodological clarity for sociomaterial research in information systems. The paper offers a brief history of the "sociomateriality" approach in information systems research and its origin in the reference discipline of sociology. It shows that the original formation of the term was predominantly based on STS, feminist and Actor Network Theory studies and its later development in IS is based on Barad's post ANT/feminist theory of Agential Realism. Seeking methodological guidance from ANT studies could be fruitful as it shares similar grounds with Agential Realism however ANT could be seen as a weaker version of sociomateriality than agential realism. As of Parsons and Shils' (1951) Theory of Action, it is a respected theory in social science that provides a structural-functionalist perspective. Its premises are fundamentally different from the post-humanistic approach of sociomateriality. Seeking methodological guidance for Sociomateriality research from very different philosophical tradition is less than productive. It sacrifices the richness of both traditions and can produce simplistic account of technological phenomena.

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