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# Technology, organization and materiality: Reflections on the problem of agency

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## ABSTRACT

In management and information systems research, there has been a long-standing debate over the relationship between technology and the organization in which it is embedded. This debate flares up periodically and this is one such time. At one extreme is technological determinism, which makes the claim that technology is the cause and organizational change is the effect. At the other extreme is social determinism, which claims that social action and interaction is the cause and technological change is the effect. Is there a way out of this debate? How can we make sense of the interactions between people and machines? In this paper, we will examine the debate, discuss what is at stake in its resolution and explore an alternative.

## Keywords

Technology, organization, materiality, agency

## INTRODUCTION

All academic pursuits are characterized by debate and this is particularly the case for the social and information sciences. Often these debates involve thinking about the core concepts and questions of the discipline. For example, philosophers have been struggling with the mind/body problem since Descartes threw down the gauntlet. Psychologists periodically return to the nature nurture debate. Anthropologists have been thinking about the concept of race as biological or social construction. Literary critics have been reflecting on the nature of the meaning of texts, with respect to authorship and intertextuality.

In management and information systems research, there has been a long-standing debate over the relationship between technology and the organization in which it is embedded. This debate flares up periodically and in a recent (2005) special issue of the *Scandinavian Journal of Information Systems*, Rose, Jones and Truex (2005; 134) offer an account of the debate and explain its importance, noting that it revolves around “an issue that would seem central to the IS research endeavor, that is the relationship between the technical and social aspects of IS.” A central question concerns the relationship between technology and organization and the role played by agency. Rose, Jones and Truex (2005; 134) argue that the debate must be revisited “if the IS discipline is to develop a consistent socio-theoretical vocabulary.” Hanseth (2005; 159) concurs and states that the relationship between technology and organization “is indeed the very core issue of IS. At the same time -and in spite of the long-standing debate - the understanding of this issue within the field is very poor.”

What is clear is that the debate involves a dualism, the contours of which can be seen at its extremes. At one end of the continuum of positions is technological determinism, which makes the claim that technology is the cause and organizational change is the effect. At the other is social determinism, which claims that social action and interaction is the cause and technological change is the effect. While very few researchers operate at these extremes, Rose, Jones, and Truex (2005; 135) suggest that the assumptions of deterministic thinking are more pervasive than might be expected and work their way into the debate. They describe two main theoretical paths that researchers in information systems research have taken, argue that these paths have been very influential in shaping the current instantiation of the debate and show that the two paths are based on incompatible conceptions of agency.

In the special issue of the journal, five articles were solicited in response to Rose, Jones and Truex’s provocation (Walsham, 2005; Hanseth, 2005; Holmstrom, 2005; McMaster and Wastell, 2005; Orlikowski, 2005). In this paper, we provide a sixth response in which the debate is placed into an historical context, its importance is discussed and an alternative is proposed

which attempts to shift the debate from the problem of agency to the consideration of technology as an object with materiality.

### ON DUALISMS

To place this debate into perspective, a digression into the history of sociology is useful. Dualisms have been at the center of sociology, a discipline some of whose theories have had significant impact on information systems research, since its founding in the late 1800s. Durkheim, one of the early proponents of the field, worked tirelessly to establish sociology as an independent academic discipline creating the first department of sociology at the University of Bordeaux in 1895 and founding and editing “*L’Annee Sociologique*,” the discipline’s first journal in 1898. Among his lasting contributions is the concept of social facts (Durkheim; 1982), which cannot be reduced to or explained by the actions of individuals; society, in this formulation, is always greater than the sum of its parts. Durkheim uses an organic metaphor at the center of his social ontology where society is the organism and individuals are cells (Lehmann, 1995; 16). In doing so, he sets up an enduring dualism where society and the individual are ontologically distinct. While a political intent of this move was to differentiate sociology from psychology, a significant consequence is that the discipline has been struggling with the Durkheim’s legacy ever since; this struggle has taken the form of a debate involving questions of the relationship between the society and the individual and the appropriate ways for which the dualism can be accounted for theoretically.

Within sociology this dualism has come to be known as the problem of order and has preoccupied many of the major thinkers in the discipline during the 20<sup>th</sup> century. Based on an assumption that the natural condition of humans anarchic, the need for society is justified by contrasting it with a “state of nature” where “during the time men live without a common power to keep them all in awe, they are in that condition which is called war; and such a war as is of every man against every man” (Hobbes, 1994; 14). The question then becomes what holds societies together when the natural inclination of humans is to pull it apart. For example, macro-sociologists such as Parsons (1968, 1951) try to account for the dualism by positing society as a social system and explaining how individuals in the society act in response to changes in the system, typically by adopting social roles that fulfill system needs. This form of structural functionalism has been one influential stream of theorizing in American sociology. Micro-sociologists such as Blumer (1969) approach the dualism from the starting point of the individual, explaining that out of the actions and interactions among individuals, particularly the symbolic interactions that are involved in the exchange of language, society emerges. This form of interactionism has been a second influential stream of sociological theorizing. Both approaches, however, have limitations that can be traced back to the influence of Durkheim’s social ontology. The macro-level explanations offer an interesting conceptualization of society and its structure but cannot adequately account for the individual level of social reality. Micro-level theories provide deep and rich insights into individual social realities but cannot adequately account for the societal level of social reality.

### Challenging the dualism

By the latter half of the 1900s, sociologists seemed to be either aligned with one or the other approach or dissatisfied with both and searching for a way to resolve or sidestep the debate. In the 1980s several alternatives emerged that provided different ways respond to the impasse that divided the field, two of which have had important consequences for information systems research. The first, structuration theory, was developed by Giddens (1979, 1984) in England during the 1980s. At the same time, within science and technology studies, Latour (1987), Callon (1986) and colleagues such as Law (1988) developed actor network theory at the Centre de Sociologie de l’Innovation in Paris. The limitations of this paper preclude extensive discussion of these approaches; instead the way in which each responds to the Durkheimian dualism will be briefly described.

Structuration theory challenges the dualism of society and the individual by rejecting the social ontology in which it is based. It places interaction at the center of social reality and reconceptualizes the dualism of individual and society as a duality of structure and agency, arguing that both the individual and society are co-constituted in and through social interaction. Structuration is an ongoing and taken for granted process within which structure is the outcome of and medium through which social interaction takes place. In this approach, structure is a key component of society and is composed of rules and resources. During social interaction, these structural components are drawn upon, the effect of which is to enable and constrain the interaction. The act of invoking rules and resources during social interaction recreates them, allowing society to persist over time. Two types of resources are defined in structuration theory, authoritative resources which, when invoked, allow a person to exercise control over other persons, and allocative resources which allow control over material objects. In this approach, technology is an example of the latter type of resource.

Actor-network theory also rejects the social ontology on which the dualism is based but offers a different type of approach

based on a principle of radical symmetry. In an actor network, all participants have equal status and all can interact within the network. As they act and interact they are defining themselves and the other participants and shaping the work and the social and technical practices of the network; in the language of actor-network theory, participants are “actants.” In this approach, the social and the technical components in the network are intertwined and interdependent. Because of the symmetry of actor networks, neither human nor non-human participants are privileged and that both have agency. In this approach, technology is a participant in a network and therefore has agency.

### Revisiting the debate

In their description of the debate, Rose, Jones and Truex (2005a) describe the relationship between technology and organization as involving a dualism that echoes the legacy of Durkheim. They label the poles of this dualism technological and social determinisms; in the former, they (2005; 134) explain, “technology causes changes (technology effects) in an organization which is apparently powerless to resist them” and in the latter, “technology is solely portrayed as the product of human intentions, designs and actions.” Admitting that IS researchers have not gravitated towards these poles, they (2005; 135) find that the two main theories imported into information systems research by those seeking to find a path between the two determinisms come from sociology:

“[i]nitial interest (in the community of IS researchers with their theoretical roots in social theory) was focused around Giddens’ structuration theory (ST) (Giddens 1984)” [while more] recently actor network theory (ANT) (Latour 1987) has attracted increasing attention.”

These two theories have shaped the dualism of technology and organization, sharing an appreciation for social interaction and a distaste for determinisms. However, they offer two different conceptions of technology that cannot be easily (if at all) reconciled. In structuration theory, technology is an allocative resource that is essentially passive until such time as it is invoked during social interaction, when it becomes a tool that can be used by a person who attempts to bring about a change in a state of affairs or intervene in an ongoing flow of action. Because it is a structural resource, technology cannot have agency – only people can act. In contrast, in actor-network theory, technology is an actant in the network and has agency. Actor-networks are by definition, heterogeneous, so there can be a range of actions brought about by human and non-human participants, including technologies.

The implication here is that there are two incompatible conceptions of technology that differ on the extent to which technology has agency. In information systems research, the problem of order has been transformed into a problem of agency. Structuration theory falls short because it does not adequately account for technology except as a resource to be called upon during social interaction. Actor network theory falls short because it elevates the importance of technology as a non-human participant in a network but does not make clear the nature of its agency.

### TECHNOLOGY AS OBJECT

The question of the agency of humans seems to be non-controversial except for those taking an extreme technologically determinist position. The rest of us accept the individual’s agency and can decompose it into a collection of characteristics and potentials such as motivation, intentionality, ability to exercise power, etc. For example, Giere (2004: 762) argues that

... human agents are conscious of things in their environment and self-conscious of themselves as actors in their environment. Agents have beliefs about themselves and their environments. They may justifiably claim to know some things and not other things. Agents are capable of making plans and some times intentionally carrying them out. Agents are also responsible for their actions according to the standards of the culture and local communities ...

To think about the agency of technology it is helpful to think about technology as an object and a material artifact. This raises issues of the relationship between materiality and the social. If agency is not limited to humans, in what sense can non-human entities be considered actors? Can they act? If so, in what sense can they be said to act? How does the agency of technology compare to the agency of humans? Are human and non-human forms of agency symmetrical? Equivalent?

The move to focus on technology as an object is not new. Orlikowski and Iacono (2001, 121; 134) state that

The field of information systems, which is premised on the centrality of information technology in everyday life, has not deeply engaged its core subject matter – the information technology artifact”

The tendency to take IT artifacts for granted in IS studies has limited our abilities as researchers to understand many of

their critical implications – both intended and unintended – for individuals, groups, organizations, and society

Two questions can be posed to begin an exploration of technology as an object. What happens if technology is considered a material object in a social world? What is the role of technology as a material object?

Harre (2002) explores the notion of technology as a material object that stands in some relationship to a social world. As an object, technology is a non-living entity that occupies space and time. To be useful it must be embedded in a social world at which point it becomes capable of interacting with human beings in positive and negative and enabling and constraining ways. Some material things are passive in relation to people while other things are active. Whether something is passive or active largely depends on the social narrative in which it is embedded. As objects, technologies can carry meanings, have significant roles to play on action, change over time, and help and hinder action (Harre 2002, 25, 26).

There are three main ways that technology as a material object becomes bound up in social narratives and therefore, the social world. The first is the task tool discourse where the narrative specifies the task and determines the category of the object to serve as a tool. Depending on the nature of the discourse, a compute can be a tool for empowerment or for surveillance and control. The second involves established conventions where social norms specify the uses and meanings of objects. The third involves informal customs where social practices specify the uses and meaning of objects. It is possible for "a material thing identified by its material attributes to exist as more than one social object, each identified by its role in a narrative" (Harre, 2002; 27).

Pels, Hetherington, and Vandenberghe, (2002; 8) argue that material objects, including technological artifacts, play an important role in the performance of the social world as “active mediators, ‘fixers’ and stabilizers of social, cultural and political networks.” This leads them to a position that technology has agency - constitutive effects within entangled networks of sociality and materiality where “materials are not things given meaning by a volitional will but are taken as ‘actants’; their agency is understood as constituted as a relational and non-volitional ‘will-as-force’.”

Day and Ma (2009) offer an approach to the technological artifact that allows it to be rethought through a critical lens informed by Heidegger’s (1977) reflections on the question of technology. Their analysis is motivated by the insight

...that social analysis is often viewed in causal terms borrowed from physics—that is, causation understood as the determinate force exerted by one body upon another, and as such, ‘users’ making use of technologies to ‘effect’ resulting products, technology’s ‘effects’ upon society, and so forth—is there a way of rethinking social causation in other terms than causes and effects?

They begin with “*techne*” or the art or craft by which a thing comes into appearance and argue that the causes that are responsible for the emergence of the thing should be seen as non-teleological and interdependent. The Aristotelian causes (formal, material, efficient, and formal) are “as mutually important, co-responsible *affordances* to which the emergent thing is indebted” (Day and Ma, 2009; 2). This implies that technological objects are “indebted” to assemblages of socio-cultural, material, and labor affordances and are social, technical, and cultural expressions of these affordances. This way of thinking about technological objects re-establishes the importance of situated action into the processes by which objects are produced and used. This has implications for how the technological artifact is studied because (Day and Ma, 2009; 3)

1) production is re-understood culturally-socially, and 2) social events are understood in terms of mutual affordances, rather than as determinate forces or causes of agents acting upon one another and upon objects or vice versa. This affects modern technological and technical studies in that *techne* is understood to underlie both. Both technique and technology in [IS] are cultural-social in nature, being made up of actions and parts arranged and used for producing meaningful acts and products.

## CONCLUSION

The debate over the relationship between technology and organization is important in information systems research because it encourages rethinking of conventional approaches to the nature of the technological artifact that is at the core of the discipline. Rose, Jones and Truex (2005a, 2005b) and their respondents have provided a useful service by foregrounding the debate and recasting it in terms of the problem of agency. This paper attempts to clear some brush in order to more clearly survey the ground on which the debate takes place. In doing so, the dualism underlying the debate has been placed in a larger intellectual context drawn from the history of sociology allowing a clearer understanding of the ways in which the two main

theoretical approaches imported from that field into information systems research, structuration theory and actor network theory, have shaped the debate.

Agreeing with Rose, Jones, and Truex that the problem of agency is important to the debate, we argued that to understand the problem of agency, it is necessary to return to the object or the technological artifact. Finally, considering the materiality of technology, the paper presents a reading of the technological artifact through a critical lens informed by Heidegger to conclude that technological objects are forms for social and cultural expression and emergence. The question then arises about what to do next.

One path to follow is to consider more closely and more critically the ways in which the insertion of the materiality of technology changes the contours of the debate, particularly with respect to the question of agency as seen in the versions of structuration and actor-network theories that have been most popular in information systems research. This might involve a critical examination of the assumptions of these approaches. How realistic are they? How might they be tested? A second path to follow is to use the materiality of technology as a lens to critically examine the conceptions of organization that both approaches seem to take for granted. How might the debate turn with a conception of organization that assumes that it is a sociotechnical phenomenon constituted and reconstituted out of the interactions of technology and the people who design, implement and use it? Both paths are beyond the scope of this paper and represent future directions for reflection and analysis.

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