

2003

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Antonio Cordella

London School of Economics and Political Science, a.cordella@lse.ac.uk

Maha Shaikh

London School of Economics and Political Science, m.i.shaikh@lse.ac.uk

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Recommended Citation

Cordella, Antonio and Shaikh, Maha, "Actor Network Theory and After: What's New for IS Research?" (2003). *ECIS 2003 Proceedings*. 40.

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Actor Network Theory and After: What's New For IS Research?

Antonio Cordella

Department of Information Systems
London School of Economics
Houghton Street
London WC2A 2AE

Tel: +44 (0)20 7955 6031, Fax: +44 (0)20 7955 7385

a.cordella@lse.ac.uk

Maha Shaikh

Department of Information Systems
London School of Economics
Houghton Street
London WC2A 2AE

Fax: +44 (0)20 7955 7385

m.i.shaikh@lse.ac.uk

Abstract

The basic argument presented in the paper is that actor network theory has often been forced to adopt the ontology of interpretivism and thus suppress its own ontology. Interpretivism is socio-constructivist in nature but ANT is not. Therein lies the gap, a gap that is traversed by using an assumed flexibility of ANT which thus allows it to be used as a lens within the interpretivist ontology. The ontology of interpretivism deems the interpreter to be in a position to construct reality in his/her mind whereas, ANT accentuates that reality is actually constructed by the interplay of more actors (both human and non human) and this reality emerges from this interaction. Therefore for interpretivism, reality is created in the mind and for ANT, reality emerges 'out there'. These differences in the ontological foundation of ANT and interpretivism must be taken into consideration when ANT is used to inform research in IS. These differences are in fact defining the object of the analysis and hence its outcome.

Keywords

Actor network theory, socio-constructivism, interpretivism, ontology, and IS research methods

1. Introduction

Actor network theory [ANT] is increasingly used as an analytical framework to inform IS research. It has often been described as the theory that gives voice to technological artefacts. In a minimalist version, ANT has been used to describe and to enlighten us to the role of technology in the process that shape the relational outcome of the interplay between technology and people. The most common use of this theory in the IS field is within the interpretative epistemology. In this context, ANT is seen as a powerful methodology to collect and analyse data that are thus interpreted or, following Myers and Walsham (1998), understood "*through the meanings that people assign to them*". Unfortunately, actor network theory has rarely been used as the ontological foundation for the understanding of the nature of the interaction between technological artefact and people and of their nature.

In this paper we criticize the use of ANT in the interpretative epistemology and hence the underpinning constructivist ontology, highlighting the alternative ontological foundation provided by ANT. Researchers that use the theory as an interpretative lens for the analysis of the effects of technology on relational networks and vice versa are not acknowledging the magnitude of the theoretical foundation of ANT. Actor network theory has thus become more of a method for data collection and analysis in interpretative research than an ontology to inform IS research. However, and this paper attempts to fill this gap, actor network theory has the potential to provide an alternative ontology to constructivism that can supply a richer milieu to inform research in IS, especially for alternative explanations of the nature of the dynamic of the interplay between technological artefacts and people.

The aim of this paper is to delve into this debate and provide a better understanding of the consequence of the use of ANT to inform research in information systems. The sections of the paper are as follows. Section 1 shows where and how ANT has been used in the IS field, section 2 covers the salient features of ANT. Section 3 expands on the main argument of this paper, addressing the reasons why ANT has been used in this way in the IS field and how it might rather be used as an ontology. Section 4 concludes the argument.

2. Actor Network Theory

The different approaches to information system research can be classified in a continuum where at the one extreme we have the theories of social construction, and at the other, techno deterministic ones (Hanseth and Monteiro, 1996, Lundberg, 2000). Along this continuum it is possible to classify the different research approaches by the importance given to technology, or society, in shaping the other. The strong dichotomist distinction between the social and the technological dimension has characterised the early studies of the diffusion of computer-based technologies in society (Dahlbom and Mathiasen, 1993, Walsham, 1997). When changes in technologies and in their use made it more difficult to clearly identify the distinction between technology and its users (Dahlbom, 1997), such as in the case of network technologies, a new interest emerged for the study of the interplay between the two.

The first phase was characterised by the research of optimal models for the management of information systems (Dahlbom, 1997). The second was more interested in the analysis of relations between technology and society in a state where the “symbolic boundary between people and information technology is in a constant state of flux across a wide spectrum of contemporary work and leisure activities” (Walsham, 1997). Actor network theory has been seen as breaking this symbolic boundary addressing the problem right from ‘inside’. Information technology and users are not defined outside their relationship but *in* their relational networks.

Latour (1987) argues that science and technology have to be studied in action and that we have to focus on the dynamics of their interaction rather than on the stability of their relationships. Actor network theory is proposed as an analytical tool that provides the theoretical and methodological underpinning for the study of these dynamic relationships. The theory is thus positioned in the middle of the debate between constructivist and technological deterministic studies. At one end technological determinism assumes that technology and its impact are given and defined, while constructivism tends to assume that technology does not matter, because it is always and inescapably socially-constructed (Lundberg, 2000).

Actor-network theory contributes to this debate from an intermediary position that systematically avoids the dualism between technology and society (Bloomfield and Vurdubakis, 1997) focusing on the processes through which socio technical networks are

created. As Law (1999) puts it, "...entities take their form and acquire their attributes as a result of their relations with other entities" (Law, 1999). In the same way, Law (1992) argues that society, organization, agents and technological artefacts are all effects generated in patterned networks of diverse materials.

These considerations move the focus of the analysis from the actor, either technology or society, towards a more complex and less defined phenomenon, that is the interaction. This change in focus not only affects the analysis of the phenomena, but also the assumptions about the nature of the entities that constitute the phenomena. Actor-network theory rather incites us to reconsider sociotechnical relationships as an open ended set of interactions where the actors of the sociotechnical interplays do not pre-exist the relationships; the actor is generated *in* and *by* these relationships. It has a "relational materiality" (Law, 1999) i.e. actors achieve their form and attributes as a consequence of their relations with other actors. This reflects an aversion to accept *a priori* the pre-existence of social structures and differences as somehow intrinsically given in the order of things. There are no distinctions between social and technical subsystems. It is the relationship that produces the actors as emergent from the very interplay among different, human and non-human, entities. There is no case of a local or global dimension here, only a relational one¹ (Latour, 1999a).

This is clearly a claim against the dualistic distinction between technology and society. Technology and people do not have *a priori* different and defined effects on their relational interplay. Both participate in and mediate the relational networks, but at the same time they are the outcome of the same relationships. The concepts of subjectivity and objectivity themselves do not exist other than in the context of the relationships. Thus Latour (1999a) proposes the redefinition of the concepts in terms of intersubjectivity and interobjectivity to emphasise the relational dimensions of the two.

The relationships developed in a network that dynamically shape and re-shape the actors also recursively define the characteristics of the involved actors. The actor can thus be defined as one output of the relationship in a network where Callon defines a network as a "group of unspecified relationships among entities of which the nature itself is undetermined" (Callon, 1993).

However, and this is where the complexity and power of the theory emerges, the actors that are part of the network are also the constitutive elements of the network. Therefore, the concept of actor and network are concatenated and cannot be defined without the other – thus we have an actor-network. "The actor network is reducible neither to an actor alone nor to a network....An actor network is simultaneously an actor whose activity is networking heterogeneous elements and a network that is able to redefine and transform what it is made of" (Callon, 1987). In ANT actors are not defined and analysed in a stable set of relationships. It is the researchers who artificially define the analytical range of the study to see "what the various actors in a setting are doing to one another" (Akrich and Latour, 1992). By limiting the level or focus of the investigation it is possible to study and understand some of the relationships that are shaping both actors and the relational networks. However, it must remain clear that actors and actor-networks are naturally *embedded* in open ranges of relationships that cannot be artificially limited by the scope of any particular analysis. Actor network are "open ended" and can only be artificially (but usefully) closed and isolated from the broad and natural openness of relationships.

¹ Obviously, the analysis of the relational dimension can be more focused on the study of local or global relationships.

The complexity of the relational pattern in an actor-network is enhanced by the fact that not all the actors in the actor-network embody the same level of flexibility. Actors embody various characteristics that are the outcome of their relationships with “heterogeneous elements, animate and inanimate, that have been linked to one another for a certain period of time” (Callon, 1987). These characteristics are renegotiated in the interplay with other actors. An actor-network embodies these characteristics so that the outcome is the result of “a set of diverse forces”(Akrich, 1992) that affect and define the inter-networked relational settings. These forces can be considered as an embodiment of prescriptions by the actors. A prescription is defined as “what a device allows or forbids from the actors -humans and non-humans - that it anticipates; it is the morality of a setting both negative (what it prescribes) and positive (what it permits)” (Akrich and Latour, 1992).

When an actor is analysed in isolation (taken out from the network) it is seen to embody specific inscribed characteristics that may strongly affect the configuration of the contextual relational network under analysis. But the settlement of the actor-network is not defined *a priori*. It emerges from the complex, open set of relations and from the characteristics of the elements that are part of and constitute the actor-network. People and technology “are never located in bodies and bodies alone, but rather that an actor is a patterned network of heterogeneous relations, or an effect produced by such a network” (Law, 1992). As a consequence, actors do not embody action or *actantiality* (potential for action) but it is their relational dimension that generates instances of action (Latour, 1999a, Law, 1992). The actantiality is generated in a process of negotiation. A process which is circular and recursive, the course that defines and redefines actors in their multiple contexts. Actors are in action and, as a consequence, in a continuous state of mutation. This continuous relational interplay is the *performative* characteristics of actor networks, where actors are in fact “*performed* in, by, and through relations” (Law, 1999).

Thus actors and actor-networks can not embody stable characteristics but rather reflect a process of multiple trajectories that can become either stable, as a dynamic equilibrium, or reflect unstable misaligned relationships. The diverse configurations of actors in an actor-network are the outcome of the interplay between different forces. While actors are emerging and retreating from the interplay in the actor-networks they are also defining the characteristics of the interplay via their embodiment of relationships in other actor-networks. Therefore, the actors are not neutral to the relational context. As the actors are influenced by the network, they in turn influence it. The process of stabilization of the relationships in the network is the outcome of the alignment of different actors’. Actors in their interplay within the actor-network negotiate their forces in a process of translation. "By translation we understand all the negotiations, intrigues, calculations, acts of persuasion and violence thanks to which an actor or force takes, or causes to be conferred to itself, authority to speak or act on behalf of another actor or force." (Callon and Latour, 1981). Translation is the circular process of “interpretation” or as Callon (1991) puts it, the “definition” that every actor makes of other actors in the actor-network.

Such dynamics of translation reflect different levels of rigidity of the inscription and alignment of the actors achieved in the actor-network. When actors translate each other they try to enrol the other to “support” or believe in them (Latour, 1987). The less prescribed actors get more easily translated into the interest of others, than more rigidly inscribed and prescribed ones. This is a consequence of actors with lower prescriptions being more easily reconfigured into the interest of others with stronger inscribe trajectories. If the process of translation does not result in an alignment of interest, it is considered misaligned. In this case the actors are configured in “separate spaces with no common measure” (Callon, 1991) A

misaligned actor-network does not produce a stable set or relationships that can be analysed as a stable and configured output of the relational interplay in the actor-network. This means that the actor-network cannot be *black boxed* and thus considered as an element produced by many elements acting as one (and most actor networks are of this type) (Latour, 1987).

Finally, recalling the concept of circularity of the actor-networks relations, it is clear that every actor-network affects and is affected by the characteristics of the actors and then by the different interests the actors bring to the actor-network. Every actor can bring characteristics that have emerged from other actor networks to which it belongs because an actor can and usually does belong to more than one actor-network at one time. Recursively, new, emergent characteristics are re-proposed back into the other actor-networks. This circularity explains the action that is endogenous to the relational interplay analysed by actor network theory.

3. Actor Network Theory in Information Systems

The significance of the interplay between technology and society is not new in the IS literature, nor is ANT the only theory to address this issue. In the 1990s structuralist models of technology addressed the problem of interplay between technology and users (Orlikowski, 2000); the same can be said for hermeneutics (Lee, 1994) and phenomenological studies of information systems (Boland, 1985); but in these contexts it is the interpretivist approach which has been growing in strength in the IS field from the mid 1990's onwards (Walsham, 1993, Walsham, 1995, Klein and Myers, 1999, Lee et al., 1997). Within IS research interpretivist approaches acknowledge that, although information systems have a physical component which permits their technical operation, they are designed and used by people operating in a complex social context (Doolin, 1998). Thus, an information system is understood (constructed) differently by different individuals, and is given meaning by the shared understanding of such phenomena which arises out of social interaction and not from the essential characteristics of the technology: "Events, persons, objects are indeed tangible entities. The meanings and wholeness derived from or ascribed to these tangible phenomena in order to make sense of them, organize them, or recognize a belief system, however, are *constructed realities*" (Lincoln and Guba, 1985). The interpretive epistemology thus considers knowledge within a constructivist ontology, and the use, design and study of information systems in organizations is thought of as a hermeneutic process of reading and interpreting this construction as a text (Walsham, 1993).

We see the spread of ANT in the IS field as associated with the interpretive epistemology and hence with the constructivist ontology (Walsham, 1997, Wynn, 2001). Following this assumption, the relational dimension of technology and people is explored and interpreted in this set of paradigmatic assumptions. A large number of the studies in IS which are based on actor network theory focus attention on how specific inscribed characteristics of actors affect a chosen actor-network, where inscription is defined, following Akrich's (1992) socio-constructivist explanation, as the activity of "designers" who define "actors with specific tastes, competences, motives, aspirations, political prejudices, and the rest, and assumes that morality, technology, science, and economy will evolve in particular ways" (Akrich, 1992). Among them, Hanseth and Monteiro (1996) for example discuss the role of standards in the shaping of large information system infrastructures. Similarly, the same authors (1995) examine the effects of standards on the achievement of flexibility in the actor-network that shaped the TCP/IP protocol. While, Timmermans & Berg (1997) analyse how medical protocols affect the contingent practices of the medical intervention, Bowker and Star (1994) study the effect of the use of the International Classification of Diseases within different actor-networks.

However, an alternative use of actor network theory can be applied to analyse the process that leads to a possible stabilization of an actor-network (irreversibility). Take for example the case discussed by Hanseth and Monteiro (1996) which highlights the role played by different standards in defining the development of an IT infrastructure. The use of ANT's ontology here would have emphasized the process (interaction among different actors, human and non human) rather than the effects of specific inscriptions on the infrastructure development. In this case the focus, rather than on the study of the effects of more or less black-boxed inscriptions on a specific actor-network, would be on the analysis of the interplay that takes place in the actor-network that can indeed then result in a black-boxed relationship. This formulation of the problem rather than "opening the black-box" to study the process that made it stable "tracks the process *before the box actually gets closed*" (Lanzara, 1999).

4. ANT: Ontology or Lens?

In some of the recent work on actor network theory the focus has been on whether reality exists "out there" or is a product of our mind (Latour, 1999b). Generally speaking, two different assumptions can be taken to elucidate this ontological dilemma. Choosing one answer rather than the other, such as positivism or constructivism, not only answers the question about the assumption underpinning the understanding of the existence of reality, but also determines the range of methodologies or approaches that can be used to study the phenomenon that constitute reality².

If nature and social reality are recognised as existing "out there", the task of the researcher is to solve the problem of explaining the given phenomena. Myers (1997) describes the position taken by positivist research as one characterised by formal propositions and quantifiable measures of variables articulated to describe the reality that is considered as objectively given. Burrell and Morgan (1979), through their subjective-objective dimension which groups nominalism, anti-positivism, voluntarism and ideographic on one side with the opposite of each respectively being realism, positivism, determinism and nomothetic, show how social scientists are faced with the ontological question "whether the 'reality' to be investigated is external to the individual – imposing itself on individual consciousness from without - or the product of individual consciousness; ... whether reality is a given 'out there' in the world, or the product of one's mind". Actor network theory, if its own ontology is allowed to surface, would fall into the latter category of Burrell and Morgan. However, this distinction, though useful at times has been criticised by Deetz (1996) for being restrictive, narrow and biased.

If reality cannot make direct reference to the world "itself," but needs some intermediation so that nature and social reality are constructed *via* this intermediation, the task of the researcher is to interpret and hence explain the processes that are "producing" the phenomenon. Interpretivism, like positivism, is itself socially constructed, populated with social science researchers whose shared beliefs include the four concepts outlined by Lee (1997). First, the subject matter of interpretative research involves the 'life world', which includes humanly created meanings, be they individually held or those shared by groups. Second, the researcher himself must inevitably serve as an instrument of observation. Third, interpretation is iterative (hermeneutic) and lastly the validity of an interpretation can be assessed³ (Lee et al., 1997).

² Morgan (1980) advises that paradigm and methodology are so closely concatenated that it is very difficult to make explicit distinctions between the two.

³ There are numerous ways of assessing the validity of an interpretation. With a good interpretation, any apparently absurd or irrational behaviours would no longer appear so. The burden is on the reader to reach an understanding of the text so he must read on or re-read and

Interpretive approaches to research thus adopt the stance that knowledge is a social construction, and that such ontological positions concerning reality provide ways of 'making sense of the world' rather than 'discoveries about the world' which represent absolute truth (Walsham, 1993). The very act of 'making sense' would imply that reality is constructed by interpretations that emerge from analyses based on alternative and non-univocal interpretative lens. ANT has often been considered as one of the possible interpretative lenses available to analyse and thus interpret the complexity of the dynamics associated with IS use (Walsham, 1993, Monteiro and Hanseth, 1996). The word lens here is used in the sense of Orlikowski (2000) where certain features emerge and are focused on, and where the rest in the picture fall into the background. It is a 'way of viewing', such that Klein and Myers (1999) emphasize in one of their principles of interpretive research, that of the Principle of Contextualization.

Following this rationale, ANT, instead of providing a new ontology to expose the nature of relationships, is used as a method within an alternative ontology. Interpretivism considers reality not as an emergent phenomenon, as in the case of ANT, but as an outcome of the process of interpretation of people. Actor network theory, compared to interpretivism, clearly argues against the notion of constructivism. ANT maintains that the constitutive forces in the interplay among actors themselves define, constitute and construct this interplay (Law, 1999, Latour, 1999b). This theoretical stance is indeed critical towards constructivism, social-constructivism and hence interpretivism. The *essence* of the theory stands in the argument of the co-definition and co-evolution of objects and humans, both called indistinctly, actors. Thus, the constitutive essence of actor network theory cannot be confused with the constructivist assumption of interpretivism. It follows that ANT does not only propose a new way of questioning reality; it also introduces a new way of conceptualising the understanding of reality. What Latour (1999b) calls 'realistic realism' (Stalder, 2000).

Actor network theory, if considered in its ontological dimension clearly distinguishes its nature from other constructivist approaches to the study of technology and organisational interplay. All constructivist approaches have in common the assumption that technology and technological change cannot be analysed as linear and clearly delineated processes. Rather, technological change is the outcome of "a number of technological controversies, disagreements, and difficulties, that involve different *actors*" (Brey, 1997). However, rather than considering these actors or groups as engaged "in strategies to win from the opposition and to shape technology according to their own plan" (Brey, 1997), ANT considers the interplay between the different actors, technology included, as the constitutive force. Actor network theory does not distinguish between technical and non-technical humans elements emphasizing the heterogeneous character of their relational nature. It argues that reality does not exist *per se*, but states that the construction of reality is achieved through the interplay between different actors, both human and non-human, with equal constitutive characteristics (Latour, 1987, Law, 1992, Law, 1999).

Amsterdamska (1990), in a review of Latour's *Science in Action*, criticized ANT and Latour for trying to strike an uneasy balance between his realism and constructivism. This critique hinged on Latour's first principle, which states, "The fate of facts and machines is in later users' hands; their qualities are thus a consequence, not a cause, of collective action". Amsterdamska (1990) insists that this is the most direct proof of the social constructivist nature of ANT. However, to go back to Latour's statement, we need to dissect the two

search for clues to make sense of the text. When the ambiguities are ironed out and he re-reads the whole text he will see 'new' ideas emerge from what he previously thought he understood. This is a simple hermeneutic interpretation.

sections. Latour's first claim that the fate of all actants is in later users' hands could seem to imply interpretivism, but the second half of that section does a severe turnabout and clarifies more exactly what Latour wants to achieve. In a subtle way the fragment actually points out that action happens 'out there' and that reality is constructed, emerges, as it 'happens'. The actants themselves are the 'later users' hands' who create action (together) so the one watching the action and trying to interpret it cannot change the situation in any way, but are obliged to hear the actants speak for themselves and tell their story. In one clean sweep, Latour does away with the need for an interpretivist stance!

If there is no need for an interpretivist approach then why and how is it that the IS field has used ANT as part of this approach for so long and so comfortably? One easy reply to this question is that ANT has been used too often in IS research just as a lens. This lens colours or dictates how we view the world and collect data. In this way ANT is very similar to an approach or underpinning assumption that, to a great degree dictates how, when and what we 'see' as data. When a researcher employs ANT s/he *will* collect data that comes to attention – and what surfaces as important data here will be guided by the 'lens' of the theory. In this way, ANT is used as a descriptive methodology. "Interpretive methods of research adopt the position that our knowledge of reality is a social construction by human actors. In this view, value-free data cannot be obtained, since the enquirer uses his or her own preconceptions in order to guide the process of enquiry." (Walsham, 1995).

In contraposition, we argue that the researcher must allow the actants to 'speak'⁴ for themselves and not put words in their mouths. Any attempt to interpret the actants in the heterogeneous networks would invalidate the first principle given by Latour, and Amsterdamska (1990) would seem to agree. Moreover, using the ontological dimension of ANT, this attempt would simply become an action of merely *one* of the actors in the network. ANT is concerned with the *interplay* of more than one actor and what emerges from this interplay. Thus it seems that ANT considers reality to be "emerging out there" while interpretivism states that reality is constructed via interpretation. Using this ontological dimension of ANT, this action would be configured as one act, among others, within the complex heterogeneous network. In order for reality to actually materialize, ANT requires that there be interaction amongst actants and it is *only* from this interaction that reality can emerge.

An analysis of the different ontologies, and ANT and interpretivism do both have their own distinct ontology, helps to clarify how the socio-constructivist assumption of interpretivism allows easy accommodation of ANT, but only when ANT is used as a means (lens) to locate or extract data. In a sense then ANT is amenable to use as both a lens and ontology. This paper is a push to question why, if ANT has its own ontology, do many IS researchers only use it as a lens? Does this do justice to the complexity and magnitude of ANT if we restrict our use to only an interpretation of part of it? ANT has been used as a lens only because this is the outcome of a constant use of this theory in an interpretivist context and thus accordingly ANT itself has been interpreted and constructed within its use. In contrast, using an ANT perspective, the theory evolves and is defined within its use. Paraphrasing Law, ANT is not anything in particular" (Law, 1990), but is what it is.

Conclusion

The use of ANT as a lens is coherent within the interpretative ontological constituency, but contradicts the fundamental ontological stances of ANT, and for this reason seems at least

⁴ For more on actants 'speaking' look at Pouloudi and Whitley Pouloudi, A. and Whitley, E. A. (2000) In *Organizational and social perspectives on information technology* (Ed, DeGross, J. I.) Kluwer, Aalborg, Denmark, pp. 339-354.

questionable from a theoretical point of view. This paper is an attempt to highlight the distinct ontology of ANT and to show that the use of ANT, as more than just a lens, could prove beneficial to the IS field and this especially because ANT brings with it the unique feature where technology and humans are considered equal and co-defined within their interplay.

Using the ontology of ANT would allow us, as discussed in this paper, to provide a richer conceptualization of technology and society. The interpretivist ontology clarifies that the interpreter constructs reality, or in other words reality doesn't already exist but is constructed in the very act of interpretation. The ontology of ANT is that reality emerges through the interplay of various actors, so in a sense reality becomes 'real' when actors interact. In the words of Latour (1999b) himself, "all the absurdities [which] I have disputed for twenty-five years [are]: that science is socially constructed; [and] that there is no reality out there; ... such nonsense".

Acknowledgement

The authors are very grateful to Dr Tony Cornford for the constructive criticism and precious help in ironing out so many of the issues raised in the paper.

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