1-1-2014

Actor Network Theory

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Abstract

Actor-Network Theory (ANT) emerged from science and technology studies, though it was inspired by grounded theory and semiotics. In the 1970s, Bruno Latour (a French anthropologist and social scientist) and Steve Woolgar (a British sociologist) undertook ethnographic field work at the Salk Institute in California. This research was inspired by grounded theory and Latour and Woolgar approached their study of work in the endocrinology laboratory as if they were anthropologists observing a hitherto unknown and strange set of practices. In other words, they did not fit their observations into any preconceived notions of scientific method, or how science 'should' be done. The resulting, highly influential book Laboratory Life: The Social Construction of Scientific Facts(1979, re-released in 1986 with additional commentary) gave a detailed account of the everyday activities of scientists. Latour and Woolgar highlighted the importance of material objects in the construction of scientific facts - rats, mice, machines, chemicals, traces of paper coming out of machines (raw data) and documents and drawings that were eventually transformed into journal articles. The latter were particularly prized, and much effort went into persuading readers that the claims in articles represented 'facts' about nature. The material objects deployed and constructed in the lab (graphs, tables of results, pictures) were key elements in this persuasion. As such, they were scientists' allies - things they could point to as 'proof' if anyone should dare question the validity of their claims.

Keywords

theory, actor, network

Disciplines

Business

Publication Details

Garrety, K. (2014). Actor Network Theory. In H. Hasan (Eds.), Being Practical with Theory: A Window into Business Research (pp. 15-19). Wollongong, Australia: THEORI. http://eurekaconnection.files.wordpress.com/2014/02/p-15-19-actor-network-theory-theori-ebook_finaljan2014-v3.pdf

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Actor-Network Theory (ANT) emerged from science and technology studies, though it was inspired by grounded theory and semiotics. In the 1970s, Bruno Latour (a French anthropologist and social scientist) and Steve Woolgar (a British sociologist) undertook ethnographic field work at the Salk Institute in California. This research was inspired by grounded theory and Latour and Woolgar approached their study of work in the endocrinology laboratory as if they were anthropologists observing a hitherto unknown and strange set of practices. In other words, they did not fit their observations into any preconceived notions of scientific method, or how science 'should' be done. The resulting, highly influential book *Laboratory Life: The Social Construction of Scientific Facts*(1979, re-released in 1986 with additional commentary) gave a detailed account of the everyday activities of scientists. Latour and Woolgar highlighted the importance of material objects in the construction of scientific facts – rats, mice, machines, chemicals, traces of paper coming out of machines (raw data) and documents and drawings that were eventually transformed into journal articles. The latter were particularly prized, and much effort went into persuading readers that the claims in articles represented 'facts' about nature. The material objects deployed and constructed in the lab (graphs, tables of results, pictures) were key elements in this persuasion. As such, they were scientists' allies – things they could point to as 'proof' if anyone should dare question the validity of their claims.

In many ways, this mode of understanding science turns the 'standard' view of scientific method on its head. Statements about nature do not become 'facts' because they are discovered to be 'out there' independent of or prior to scientific activity. They become 'facts' when scientists assemble a network of allies that is strong enough to withstand doubts and challenge. As Latour framed it in a later work, *Science in Action* (1987) adherents of the standard view believes that,' When things are true, they hold'. In the ANT view, 'When things hold, they start becoming true'. This has led to some misunderstanding, as many have read the 'social constructivism' inherent in this view as implying that 'anything goes', that any claim about nature is as true as any other. This is not the case. Those who succumb to this confusion fail to take sufficient note of the importance of material objects in the construction of truths. To be successful, claims to truth need to be supported, in ANT terminology, by chains of association that render those claims robust and enduring.

Laboratory Life was followed by other studies that explored how the success and failure of scientists and technologists could be explained by tracing their attempts to build chains of associations connecting humans and nonhumans. Examples include stories of how Electricité de France failed to introduce an electric vehicle in France because the fuel cells did not co-operate (Callon 1986a), and how an attempt to develop knowledge about scallops off the coast of France failed because they did not allow themselves to be trapped consistently (Callon 1986b). During the 1980s, Michel Callon, Bruno Latour and John Law set out the basic components of ANT in greater detail (Law 1986; Latour 1987). The main methodological principle is 'follow the actors'. To investigate how something becomes 'true', routine or accepted, the researcher finds a point of origin and traces how networks spread, who or what was enrolled, and how interests were translated. Translation is a sort of exchange whereby actors join networks because it is in their own interests, as well as the interests of the network builder. Nonhuman 'actants' participate in networks by taking on some functions of humans. For example, speed humps slow cars down, and the technologies of automatic parking stations discipline people and cars to behave in certain ways.

The ANT approach is firmly empirical and eschews explanations using abstractions such as 'social forces', 'structures' or 'factors'. To the extent that we can identify these phenomena, they are emergent *outcomes* of actor-networks; they do not explain how they come about. ANT has been described as having a 'flat ontology' (Whittle & Spicer 2008). That is, it discourages categorisation of things and explanations into micro or macro, social, legal, scientific, political, human or technical. Power and agency are not explained by these categories, but by the effects of networks. When giving lectures on power and politics to students, I illustrate this by asking them to do a thought experiment. I ask them to imagine a powerful person such as the President of the People's Republic of China, and put him/her in the middle of a desert. Take away his/her car and mobile phone. How powerful is he or she? No more powerful than the rest of us. His or her power is an effect of his/her capacity to mobilise others through heterogeneous networks made up of humans and nonhumans. A-N theorists coined additional terms and concepts to enrich their notion of networks. 'Obligatory passage points' such as laws and mandated standards can be inserted into networks to constrain choice. At certain nodes, there are 'centres of calculation´ (policy bodies, senior management, senior army command) that bring together many resources in ways that enable the actors associated with them to mobilise extensive networks with single decisions or commands.

One of ANT's greatest novelties and contributions is the inclusion of nonhumans in sociological analysis. Part of this I think is a French propensity to be provocative and even to inject some humour into academia! (A good thing in my view). Hence, we see a paper by Latour (writing under the name of Jim Johnson to make his work more amenable to US journal editors) on the sociology of a door-closer (Johnson 1988), and, a plea to include the 'missing masses' of 'mundane artefacts' in our theorising (Latour 1992). Some of the earliest criticism of ANT came from other sociologists of science who saw the inclusion of objects as decisive elements in the creation of knowledge and as not very different to traditional positivist approaches in which scientific 'facts' are already out there, independent of human activity, waiting to be 'discovered'. This provoked what became known as the 'epistemological chicken' debate, which probed the limits and meanings of social constructivism (Collins & Yearley 1992; Callon & Latour 1992).

This debate was occurring as I was beginning my PhD, which examined how, despite ambiguous experimental findings, scientific knowledge linking consumption of cholesterol and saturated fats to high blood cholesterol levels and an increased risk of coronary heart disease became 'true' enough to influence dietary policies in many nations. I found the 'follow the actors' method very useful for exploring this issue, but there was a problem. As an 'actant', cholesterol itself was elusive, and not easily enrolled into the networks of scientists advocating fat and cholesterol restriction. Sceptics found many ways to challenge the developing network. Other 'factors' were needed to explain the development of 'facts' that linked a fatty diet to heart disease. Although (or rather, because) ANT failed to answer my research question, I found it very useful for pushing my thinking about the issue. I wrote a journal article that argued that ANT needed to be combined with other sociological perspectives, such as social worlds theory (from symbolic interactionism – the source of grounded theory) in order to explain how scientific controversies are settled (at least temporarily). This article was published in *Social Studies of Science* (A*) in 1997 (Garrety 1997). It has been cited 62 times in Google Scholar and 25 times in Scopus. It was also translated into Chinese and included in Taiwan's first Science and Technology Studies Reader, along with articles by T. P. Hughes, Langdon Winner and Bruno Latour.

The only other time I have explicitly used ideas drawn from ANT is in an article written with Richard Badham on user-centred technology design. This made use of a lesser known aspect of ANT developed after the 'epistemological chicken' debate when Latour became increasingly interested in the inseparability of the 'human/social´ and 'technical'. This spurred a stream of work around modernity and amodernity, and the hybrid nature of entities. I explain this hybridity

to students with another thought experiment. Imagine me (or any other academic) being moved to another office without my 'stuff". I, Karin Garrety, as an actant in the university network will not be able to do much (if anything) in a strange office devoid of my things. I can only exercise agency in combination with my computer, telephone, diary, books, pieces of paper, etc. In other words, my identity as an academic goes beyond my human body to include the sociotechnical network through which I do my job. In the article on user-centred design, we made use of an offshoot of Latour's interest in hybridity – his pragmatogony (Latour 1994, 1999). In the article, I describe the pragmatogony as, 'a bold and speculative grand narrative that places our interactions with technology in a long-term historical perspective' (Garrety & Badham 2004, p. 193). Another extract from the article outlines Latour's ideas about hybridity as follows:

> *According to Latour, we cannot and should not think about humans, or about nonhumans, in isolation from one another. The earliest stirrings of human characteristics among our primate ancestors were accompanied by the use of tools. We have, for so long, lived among and through our myriad objects, that we cannot really understand who we are without taking them into account. Likewise, our tools are so deeply infused with our knowledge, aspirations and intentions that they don't make much sense without us. Moreover, they do more than just reflect and embody social relations. Because we have delegated functions to them, they possess (a type of) agency* (Garrety & Badham 2004, p. 194-5, citing Latour 1993, 1999).

The pragmatogony is Latour's

> *[Alternative] to the modern worldview that tries to separate and purify the categories of the human and the technical. Instead of separating humans and machines, the pragmatogony tells of successive layers of ever more complex entanglements among them. During the many thousands of years that separate us from our ape-like ancestors, there have been, according to Latour, at least 11 'crossovers' in properties between humans and nonhumans. At each crossover, new developments among humans (or among nonhumans) have brought about changes in the other. Tool use among prehistoric humans allowed the development of more complex social behaviour. This, in turn, facilitated agriculture and the domestication of animals. These 'technical' advancements permitted larger and more complex 'social' groups (towns and cities) to form, and so on. In the most recent level, which Latour dubs 'political ecology', humans are thinking about the political rights and responsibilities of the nonhumans that share our planet. As a result of ecological concerns, natural and constructed objects – whales, water, factories, cars – are being drawn into systems of legal obligations that were once largely confined to humans* (Garrety & Badham 2004, p. 195).

In the article we present attempts to institute user-centred design as another 'crossover' that was consciously designed to imbue technologies with human intentions, values and preferences. The article was published in *Science, Technology & Human Values* (an A journal). It has been cited 40 times in Google Scholar and 14 in Scopus.

Many other scholars have also found ANT to be provocative and useful, and it has been built on and modified over the years. Feminist scholars objected to what they saw as a 'macho' bias in early ANT, which privileged the viewpoints of victorious 'heterogeneous engineers' who managed to enrol and control others through their networks. Critics argued that functioning sociotechnical networks did not necessarily depend on 'dramatic triumphs and betrayals' (Singleton & Michael 1993, p. 227). They could also accommodate ambivalence, partial allegiances and multiple perspectives. The highly fruitful concept of 'boundary objects' grew out of this line of critique (Star & Griesemer 1989). While ANT's 'obligatory passage points' discipline actors in a network, and coerce them into adopting the 'facts' as legislated by the central network builder, boundary objects are more flexible as they can accommodate multiple purposes, priorities and viewpoints. A Google Scholar search for 'boundary object' on 9 October 2013 found 6,890 papers, indicating the concept has been widely used.

ANT probably works best as a method of enquiry or mode of thinking. It presents a novel way of looking at the world that can be counter-intuitive to those who are used to focussing on what

normally counts as 'organisational' – or at least the versions of 'organisation' that appear in management and organisational behaviour textbooks. The latter seem to favour a taxonomic view of the world that is composed of lists of things (lists of 'needs' that motivate people, stages of team formation, types of groups, lists of leadership styles, levels of culture, etc.). Artefacts do not feature much in these texts beyond their appearance as superficial manifestations of culture. Nor is there much consideration of how things actually *get done*. Chapters on power and politics, which have the potential of addressing this question using ANT, also feature taxonomic rather than dynamic understandings of their subject matter, with their lists of five sources of power, seven influence tactics, and so on.

Having said this, ANT has now spread far beyond science and technology studies and is having an impact in many fields, including information systems, management and organisation studies, at least in journals if not textbooks. For a number of years, John Law, one of ANT's key proponents, maintained a website tracing its spread. The latest version I can find is at www.lancaster.ac.uk/fass/centres/css/ant/antres.htm. It was last updated in 2004, which is not surprising, as keeping it up to date would be an impossible task, given that it has been taken up so widely. A Google Scholar search of 'actor-network theory' on 9 October 2013 yielded 27,100 results.

A sample of articles that illustrate and review its use in fields of interest to members of THEORI and readers of this book are listed below.

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The Wikipedia entry on ANT is a useful starting point. Some other useful websites are http://www.jonas.ax/actor-network-theory.html and http://carbon.ucdenver.edu/~mryder/itc/ant_dff.html.

Bruno Latour's website has much more than just ANT these days and is always worth a look: http://www.bruno-latour.fr/http://www.bruno-latour.fr/.

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