Actor-Network Theory for Development

Working Paper Series

Actor-Network Theory for Development working papers apply the ideas and concepts of actor-network theory to issues and cases within international development

Paper No. 1

Development Studies Research and Actor-Network Theory

RICHARD HEEKS

2013

Published by: ***Centre for Development Informatics***
Institute for Development Policy and Management, SED
University of Manchester, Arthur Lewis Building, Manchester, M13 9PL, UK
Tel: +44-161-275-2800/2804 Email: cdi@manchester.ac.uk
Web: http://www.manchester.ac.uk/cdi

View/Download from:
http://www.cdi.manchester.ac.uk/resources/ant4d

ISBN: 978-1-905469-64-2

Table of Contents

Development Studies Research and Actor-Network Theory

Richard Heeks
Centre for Development Informatics, University of Manchester, UK
Email: richard.heeks@manchester.ac.uk

2013

Abstract

This paper encourages greater use of actor-network theory (ANT) in development studies research, and introduces some of the papers that follow in the ANT4D working paper series. The main purpose is to provide development studies researchers with sufficient background on ANT to determine whether or not they might wish to use it in their work. Following a brief introduction to the novelty of ANT, the paper explains its main features via a short ANT primer that acknowledges some critique and limitations.

ANT has been little used within development studies to date. Alongside some hypothesised reasons, the paper regrets this lack of association, analysing the relevance of actor-network theory to current trends in both development thinking and development practice. That relevance is instantiated via a summary overview of seven papers in the working paper series. This paper concludes by summarising the issues in introducing an unfamiliar theory to a discipline, and by outlining some of the development research questions that ANT may be particularly good at addressing.

1. Introduction

Actor-network theory (ANT) has emerged over the past thirty years as a major conceptual force in social science. To date, though, its application within development studies has been very limited. This current paper – and the associated working paper collection – lays out the potential contribution that actor-network theory can make to our understanding of international development.

At its lightest touch, ANT can be seen as a methodology for unravelling rich descriptions of development processes, or as a sensitisation to particular aspects of development otherwise downplayed. At its most ambitious, ANT is the basis for an alternative approach to all of social science. Applications may explore different points along this continuum but will typically acknowledge core features of ANT:

- its recognition of the role of non-human, material 'actants' alongside humans in development, and
- its focus on the way in which networks of actors form and dissolve in development, particularly through the process of 'translation'.

These features mean that an investigation of ANT in development is particularly timely. Conceptually, there is growing interest in understanding agency, process and relations among development actors. In practice, there is ever-greater use of networks of individuals and organisations to deliver development; and an ever-greater role for the material (especially technology) in development processes.

ANT offers a new perspective on all aspects of development: its concepts, structures and processes. It is a view that disputes linear and objectivist visions of development and which moves beyond the dualities of technology vs. society, macro vs. micro; instead offering a more complex and emergent view that, arguably, adheres more closely to the lived experiences of development projects and processes.

ANT can also provide new insights:

- Where other accounts of development tend to describe structure and explain process, ANT does the opposite: describing processes in detail in order to explain the emergence of actor-network structures.
- Where other accounts typically sideline non-humans (technology, texts, objects, plants, animals), ANT allows them an active materiality which exposes the role they play in development.
- ANT brings to light inscribed assumptions that are taken for granted, and people who are assumed to be marginalised and powerless.
- ANT exposes the way in which networks are fundamental to development, and yet are in constant motion, explaining not just in what way membership, interests, identities and discourses change over time, but also how it is that these changes come about.

While acknowledging and building upon the significant amount of literature that already exists about, and utilises, actor-network theory, this paper and those that follow in the working paper collection show specifically ANT's potential contribution to our understanding of development structures and processes. But we also acknowledge the need to respond to critiques and limitations of ANT: methodological, analytical, moral and instrumental.

Our rationale is to make this collection a foundational point of reference for development studies researchers considering use of actor-network theory in their work. We draw together different fractions of ANT, different degrees of use of ANT, and its application to a variety of different development issues, thus providing a broad and rich picture.

We do not intend to just cheerlead for ANT. Instead, we lay out its potential value and shortcomings in order to allow development studies researchers a clearer sense of whether, and how, they might make use of it in their own work. From this position of informed choice, many may understand better why ANT would not be relevant to their work, but we also hope to help trigger anything from a trickle to a cascade of new work.

A more detailed review of ANT and its relation to development follows, incorporating history and a discussion of potential and critique. The initial papers for this collection are summarised before drawing conclusions about the types of research question to which ANT may have particular relevance.

2. An Introduction to Actor-Network Theory

Actor-network theory emerged from the field of science and technology studies during the 1980s, particularly associated with the work of three academics: Michel Callon, Bruno Latour and John Law. Taking the name first, ANT tries to understand how networks of actors form. Networks bring together actors with common interests, and those actors would not be restricted to human individuals. The notion of 'actor' is more heterogeneous than that: it can cover collectivities of humans (groups, organisations), it can cover non-humans (animals, machines, plants, documents), and it can be argued to cover the intangible (institutions, ideas). (To try to escape the typical association of the word 'actor' with humans, 'actant' has sometimes been preferred.)

The process by which an actor joins a network is seen as an act of 'translation'; meaning a displacement from one status to another (Callon 1986). Typically, this is explained as one actor reinterpreting or displacing the interests (goals, problems, solutions) or even identities of other actors, so as to align those actors' interests with their own (Law 1992). When I first arrived in Manchester, I had some interest in football and a loose affection for my hometown club, Reading. A friend persuaded me to go along with her and her mum to Old Trafford, and my understanding of my own interests and identity changed over the course of that season. I was translated

into becoming an MUFC supporter; a new member of the global actor-network that is Manchester United.

In a simple sense, translation is "an attempt to define and control others" (Horowitz 2012: 809) that seeks to shape thoughts and behaviour; a process of discussion or negotiation between human actors; a process of design when flowing from human to non-human (Williams-Jones & Graham 2003). Rather than being seen as a single act, translations will be multiple in the formation of a network and, where they occur across time or space, may be understood as 'chains of translation' (Latour 1987) that carry from one actor to the next but with each actor in the chain adding in an element of their own; a bit like the classic "send three and fourpence, we're going to a dance" anecdote.

The creation of an actor-network happens via an accumulation of translations. Callon's (1986) much-cited history of a scallop breeding programme run by a group of scientific researchers in St. Brieuc Bay in France breaks this process of translation down into four key 'moments' which are summarised as follows in the Heeks and Stanforth paper in this series:

- *"Problematisation* – the principal actors [in Callon's case study, the researchers] try to make themselves indispensable to the other actors [fishermen, the wider scientific community, scallops] by defining the nature of the problem those actors face in achieving their goals and by identifying a single way forward [the scallop breeding programme] which is described as an *obligatory point of passage* (OPP).
- *Interessement* – the principal actors lock the others into place by interposing themselves, weakening the links of other actors to alternative interpretations and strengthening their focus on the problematised OPP [the scallop breeding programme is accepted as the way forward by the various actors].
- *Enrolment* – the principal actors put interessement into practice by actions that define the roles that are to be played in enacting the OPP and the way in which the others will relate to one another within the network [those participating in the breeding programme accept their roles within it].
- *Mobilization* – the principal actors borrow the force of their passive agent allies and turn themselves into their representatives or spokespeople [the research scientists speak on behalf of the wider scientific community, the fishermen, and the scallops].

However, in Callon's case, the stability and unity of the alliance is subverted when the scallops and then the fishermen reject their designated roles. This *dissidence* or betrayal leads to the eventual failure of the scallop breeding research programme, and points to the potential failure of translation processes."

Callon's four moments are the most widely-used organising device by researchers seeking to apply ANT in their work. They are fairly easy to get one's head around and the formation of most networks – e.g. in the form of projects, programmes, policies, etc – can be reinterpreted in terms of the moments. The trajectory of the scallop programme is also a helpful reminder of the impermanence of networks: not only that they crumble and wither as well as growing, but also that they are in

constant flux and always being made and remade by all actions that take place within the network.

Yet life is not continual chaos, and ANT recognises that some networks are more long-lasting than others. This can be understood simply as persistence or as 'irreversibility'; a characteristic of an actor-network such that it is difficult to unpick and return to a situation where the translation that created it was just one among many (Callon 1987). Scott-Smith's paper and Callon (1991) both outline features of networks which are more long-lasting. The first is a successful and broad process of translation (what Callon calls 'robustness'): in simple terms that a significant number of actors join the network. The second is 'durability': the incorporation into the network of material objects. If a network just consists of people, then it is evanescent: just ideas and talk and actions. But when material objects become involved – a document that records the membership or rules of the network; a building where the network meets; a computer system that performs some of the network functions – then the network becomes harder to dissipate. Material objects are translated as they join the network but ANT researchers also call on the idea of 'inscription': the way in which particular processes, interests, identities, values, etc. become written into, embedded into, material objects.

The third feature of a long-lasting network is 'normalisation' of which a key component is that actors within the network become 'punctualised' or 'black boxed'. To understand this, we have to grasp that actors are networks, and networks are actors. When we black box an actor, we see them just as the outward expression: the person or entity; and when that black-boxed actor is part of a wider network they are said to be punctualised within that network: seen just as a single node or point. But on other occasions, we open up that black box and see what is behind the façade. A commonly-used example is a car. When punctualised within our networks, it's just a car: a tin box on wheels. But say it goes wrong. Then we see it as a network of parts that in turn were created by a network of producers linked to a network of maintainers and repairers and suppliers and transporters. We have opened the black box to see the network rather than the actor. When we do that, we start to understand that actor and may start to question it and may start to see alternative networks and possibilities. Its membership of our network may come under review. For a network to be persistent, then, you need the opposite: for actors in the network to punctualise other actors; to place them into a taken-for-granted and trusted categorisation.

There are various ways in which different kinds of networks can be categorised but a particularly-useful, though rather little-used framework from ANT is global vs. local networks (Law & Callon 1992). This sees initiatives, such as a project, connected to two main types of network: a global network that is essentially outside the project with actors that provide the space and resources (money, expertise, political support) for the project to take place; and a local network of actors which actually implement the project. This has a particular value because it provides an explanation for trajectory – e.g. the success or failure of a project – based on the strength of the global and local networks and the ability to create a strong, single

point of passage between the two. Network strength could be understood in the same terms as irreversibility (robustness, durability, normalisation (including punctualisation)) but has more simply been seen as a process of 'convergence' that derives from the alignment of actors' interests and roles, and of 'coordination' by rules or conventions that constrain the flexibility of differing interpretations of those interests and roles (Callon 1991).

We have discussed actors and networks and translation processes but have so far missed an important aspect: the space between actor-networks which can be described through various ideas:

- *Obligatory point of passage* has a conceptual sense as used above; i.e. a single way for an actor to think about how to progress towards their goals; but also a more operational sense as with local/global networks, of a single channel through which exchange between actors takes place.
- *Intermediary*: is anything that passes from, and stands between one actor to another. Examples could be an artefact (such as an item of technology), text (a document or speech), money, or a person. These are all actors but, if they are identified as intermediaries, it means they do not translate – "An intermediary … transports meaning without transformation" (Latour 2005: 39) – so they are passive and predictable.
- *Mediator*: an active presence between actors: "Mediators transform, translate, distort, and modify the meaning of the elements they are supposed to carry" (*ibid.*). They are the same kind of actor as the intermediary; just that they act in a different way. So an actor can be an intermediary in one network, time and place, and a mediator in another. Latour gives the example of a well-functioning computer system that intermediates but then becomes a mediator when it breaks down.
- *Boundary object*: is a particular type of intermediary that has a place in different networks with different roles or meaning in those networks (Star 1989). Like all intermediaries these can be "stuff and things, tools, artefacts and techniques, and ideas, stories and memories" (Bowker & Star 1999:298) as well as people. Boundary objects are sometimes categorised (Star 1989, Gasson 2006) into: repositories of information, standard forms and procedures, ideal types or models, terrains or maps, and group membership. An example might be a LogFrame document that sits within the networks of both donor and project implementer, acting to connect and coordinate between the two, yet holding different meanings within those two networks (Stanforth 2009).
- *Immutable mobile*: is an intermediary that is strongly inscribed and can carry its meaning across time and space. For example international standards of accounting are able to exert an influence throughout most countries of the world, and over a period of many years (*ibid.*). They are able to do so because they are relatively irreversible.

Finally, from all this, we can extract some of the main principles of actor-network theory[1]:

- Anti-dualism: the common reaction to many dualisms in social science – micro vs. macro; local vs. global; inside vs. outside; agency vs. structure; technical vs. social; object vs. human – has been to cheerlead for one end not the other; to try to encompass both; or to try to find some combined compromise position. ANT sidesteps all of this. It dissolves these dualities (or at least, seeks to do so) because of the way that it understands actors and networks. As the Faik *et al* working paper explains, it has a 'flat ontology' that understands the world and everything in it on a single level without any hierarchical presumptions about size or power. And this extends to its 'generalised symmetry': treating all actors as equivalent for the purposes of explanation e.g. whether human or non-human. This does not mean, though, that ANT is without its own dualisms – more that it avoids those which have been the subject of much prior discussion. For example, as noted above ANT would distinguish between strong and weak networks, and between stable/persistent and unstable/impermanent networks.
- Anti-determinism: actor-network theory is irreductionist (Latour 1996b); that is, it rejects the determinisms which see that phenomena can be explained: in terms of natural laws, or social structure, or technological properties, or semiotic meaning. At its strongest, ANT takes on the 'sociology of the social' (Latour 2005): the assumption that social structure has a stability that can be used to explain. Instead, ANT sees this as what is to be explained not what explains: "social structure is not a noun but a verb" (Law 1992:385).[2] ANT has a similar relationship with power. It is simultaneously "all about power" (*ibid.*: 387) and arguing "that the notion of power should be abandoned" (Latour 1986: 278) because it moves power from explanans to explanandum: showing how power is composed not exerted.

2.1. Critiques of ANT and Responses

Drawing from but extending the Heeks & Stanforth paper in this series, we can identify four categories of critique: methodological, analytical, moral and instrumental.

Methodologically, ANT can be difficult to put into practice. The epitome of good ANT research is a book-length thick description of a particular initiative (e.g. Latour 1996a, Law 2002), and would ideally be gathered by long-term ethnographic research that traced closely network development over time. Yet most researchers have to restrict themselves to short-term research published via journal articles. This – along with ANT's complexity, diversity, volatility and ofttimes failure to offer

[1] Callon (1986) asserts these to be 'agnosticism' (presenting all views without judgement), 'generalised symmetry' (treating all actors equally; e.g. human and non-human), and 'free association' (imposing no *a priori* categorisations or explanations).

[2] Though of course, once a network has been created and has some durability, it becomes a structure that may provide explanation. Thus even Latour (2005:10-12) allows that more structural approaches will be reasonable where assemblages are "already accepted in the collective realm" (e.g. punctualised networks). But this is "not ANT", with ANT's focus being situations of flux.

practical guidance – leads many researchers to fall back on the use of organising devices such as the moments of translation or the local/global networks frames mentioned above. The relative simplicity of these devices runs the risk of betraying the intended richness and inductivism of ANT (Heeks & Stanforth forthcoming).

Even if long-term research methods and long writing outlets were available to most researchers, there are still intrinsic methodological challenges in working with ANT. Callon's (1986) injunction in telling an ANT story is to 'follow the actor' but this clearly introduces a subjectivity in choice of which actor to follow as well as framing choices around network boundaries and time frame. ANT thus stands accused of not simply following its actors but of imposing the worldview of the researcher in this and other ways. For example, in attributing agency to non-human actors, ANT does something that most humans involved in networks do not; likewise in seeing the relativism of claims to knowledge (Whittle & Spicer 2008).

At the least, all of this requires some reflexivity on the part of the researcher; an acknowledgement of ANT's methodological challenges and that the researcher's account is not the only one that could be given.

Analytically, the great danger of ANT's anti-dualism and anti-determinism is that it describes everything and explains nothing. Its originators do not claim more than this for it: "actor-network theory is descriptive rather than foundational in explanatory terms" (Law 2007:2). But as Mitev (2009) notes, this is doubly problematic. First (again reflecting the way in which ANT does not completely follow the actor), it sidesteps the fact that actors tend to provide explanations. Second, it falls short because readers tend to demand explanations.

The response of a number of researchers has been to combine actor-network theory with other theories, in order to generate greater explanatory power. Examples include combining ANT with connectivism theory (Bell 2010), institutional theory (Donnelly 2007), and structuration theory (Greenhalgh & Stones 2010) among others.

Some of these combinations have been attempts to address two other conceptual critiques. One (e.g. Miettinen 1999) argues there <u>is</u> some determinism within ANT – rooted in the interests and intentionality of the human actors; most particularly the focal actor – which one must turn to other theoretical frames in order to understand. The other (e.g. Walsham 1997) sees ANT taking insufficient account of broader social structures. Despite the robust counter to this from Latour, Law and others that ANT integrates macro- and micro-structure (*ibid.*, Mitev & Howcroft 2011), the value of combining with, for example, structuration theory to produce monsters like 'StructurANTion' is still argued (Brooks and Atkinson 2004).[3]

[3] There have also been conflicting critiques around the symmetrical treatment of humans and non-humans. Early critiques argued they should not be treated symmetrically since, for example, there is a difference in agency and intentionality between humans and non-humans (Walsham 1997, Mitev & Howcroft 2011). When ANT answered this, the subsequent critique (e.g. Whittle & Spicer 2008:617) was the mirror image: that ANT creates "artificial divisions between the social and natural world".

Morally, the accusation has been that ANT is amoral and apolitical: silent on the unequal distributions of power that enable some translations and then networks to dominate over others (Whittle & Spicer 2008). One resolution has been to combine ANT with power-related conceptualisations such as Clegg's "circuits of power" (Mitev 2009). But ANT writers themselves have denied the accusation; firstly noting no inherent amorality within ANT and also expanding on its constituent understanding of power (Law 1986, Latour 1991). Then, seeing these ideas being put into practice in ways that show both how 'networks of the powerful' (Star 1991) maintain themselves but also how these networks are contingent and temporary, and how in many conventional senses the powerful have no actual power (Law 1992). Work like the Ernstson paper in this working paper series uses ANT to show the opposite: how the supposedly-powerless can come to be empowered not merely in forming a network but also in challenging dominant conceptions of what development means and how development is performed.

Instrumentally, ANT has faced the challenge – akin to the accusation of amorality – that it was seen as a tool to understand the world, not to change it. Such a stance is anathema to the norms of research publication and the growth of the research impact agenda, leading to concern about a lack of ANT applicability to practice (Cresswell *et al* 2011). Given the normative pressures on them, researchers have, inevitably, drawn practical conclusions from ANT-based research; sometimes following Law's (1992:387) note that "there is more than a hint of Machiavelli in the method". The essence is to advise practitioners to manipulate processes of translation and network-building to their own advantage and agenda; something that has been seen as wrong both conceptually and morally (Whittle & Spicer 2008). But there is no necessary selfish and manipulative instrumentalism within ANT: 'softer' practical implications can be drawn – seeing ANT merely as a sensitising device to the importance of networks; and more critical practical implications can also result, with ANT helping us understand who is excluded, how they are excluded, and how networks might be developed that run counter to dominant hegemonies.

3. Actor-Network Theory and Development Studies

3.1. The Challenge

Despite the importance of ANT within social sciences, and despite the demonstrated contribution of ANT in understanding developing country-based cases and in understanding processes and institutions that are central to international development, ANT has hardly been used within development studies as a research lens.

To be fair, ANT has been – increasingly – touching development studies at the margins. Two particular examples can be highlighted.

The first is anthropology-of-development, especially work of two Davids, Lewis and Mosse. Their main project has been to demonstrate the value of ethnographic research to development but, in so doing, they have drawn directly upon Latour's notion of the 'translation' of interests and identities, and less directly upon the way in which networks of support and meaning are created (e.g. Mosse 2005, Lewis & Mosse 2006; see also Rottenburg 2009). Work in this tradition, though, has quite often been published outside development studies (e.g. Campregher 2010, Horowitz 2012).

The second is development informatics: the study of information and communication technologies in development. Development informatics has two cognate disciplines: information systems, and development studies. The former has been heavily interested in the application of ANT and, in recent years, this has washed over into development informatics, with papers directly concerning themselves with the value of theory to research within this sub-discipline (e.g. Andrade & Urquhart 2010). Again, most work in this tradition has been published outside development studies (e.g. Stanforth 2006, Fornazin & Joia 2013) and its selected cases sometimes just happen to be in developing countries, rather than it having a primary concern with international development.

We can summarise that the work from anthropology-of-development has been more central to development but less centrally concerned with ANT, while work from development informatics has been more centrally concerned with ANT but less central to development. Neither seems to have succeeded so far in making a bridgehead into the heart of development studies. A review of the top seven development studies journals from 2000 to 2012 revealed no papers using ANT as their core framework, and only a small handful making a passing mention of it, despite acknowledgement of its potential value.

Why should that be?

We will postulate some specific reasons based on direct experience (see box below) but one foundation seems to be the 'ANT4D chicken-and-egg problem'. Few development researchers use ANT because there is no foundation of ANT-based development studies literature on which to build; and practically nothing has been published because development studies researchers are not using ANT.

As a result, both development studies researchers and editors are judging ANT from afar rather than from a position of familiarity. And, from afar, ANT can appear unattractive. It appears to be – well, to be honest, it is – complex, diverse, and changeable. It can appear to be unloved by its progenitors – "there are four things that do not work with actor-network theory; the word actor, the word network, the word theory and the hyphen! Four nails in the coffin" (Latour 1999: 23) – who reject their child or at least seek to look beyond ANT (Law & Hassard 1999). Because of its origins, it may be associated solely with science and technology, not with a broader set of issues. And ANT's worst crime against academe's Gadarene rush for youth and novelty: it's been around for quite some time. ANT is a strong-willed, aging harlot

with a personality disorder. No wonder development studies' academic johns have been looking elsewhere for their analytical gratifications. However, as we argue next, ANT may deserve better treatment than this.

ANT: A Bad Smell in Development Studies
(or "Hell Hath No Fury Like an Academic Scorned")

Collecting publication experiences from the contributors to the working paper series, a recurrent theme was rejection. ANT in the 2010s seems to carry the Sadim touch when it seeks to engage with development studies with a full house of rejections from every one of the leading development studies journals for either ANT-based papers or special issues/sections.

The rejection messages fell into four overall categories, adding to the overall impression that ANT in development studies is like a bad smell that everyone would like to just go away:

- ***"This is just description"; "What is the puzzle that ANT solves?"; "What is ANT's value added for development"***. These are legitimate criticisms, and issues that are in part addressed elsewhere in this paper.

- ***ANT is too old.*** Editors and reviewers rejected submissions because ANT is "neither new … nor original" and because "Actor-Network-Theory (ANT) has been around for quite a while". More directly, one commented, "There is a general feeling that … ANT (and development) is no longer quite up to the minute in terms of current debates and concerns. ANT has indeed been an intriguing area of research but those consulted think that the time has rather gone by to do a special issue on it". In other words, you should have caught the wave in the 1980s or 1990s because now the spotlight of academic fashion has moved on. Though you could wait a decade or two and try again in the hope that ANT will have become retro.

- ***I don't understand ANT***. Because ANT has few adherents in development studies, papers necessarily get put out to review – and rejected – by those who do not understand it well. These are reviewers who: think actors can only be human; think actors can only be individuals; assume Long's work on actor-oriented approaches to development is the same as ANT; demand generalisations from ANT case studies; etc. Of course this doesn't just happen with ANT but it was notable that, of 12 editors and reviewers involved in the review processes collated here, only two clearly demonstrated prior experience with ANT. Both of them recommended acceptance; the only two to do so.

- ***This is about practice; development studies isn't interested in practice***. Editors and reviewers can be quite narrow in their interpretation of what development studies covers: "Because your paper focuses on "how" issues, we do not feel that [*leading development journal*] would be the best outlet": they declined to review it, and suggested it go to *Development in Practice* instead. Of another paper, one reviewer commented: "The empirical analysis and discussion correspond rather to a

management case study. … I don't see how the lessons from this case study can be applied to development policies". Perhaps development studies should rename itself "development policy studies" if it has so little acceptance of anything other than policy, and so little interest in the processes and practice of development.

Of course, lessons have been learned from these experiences. Likely our error was to attempt to drive head on into the centre of development studies with an armoured car marked "ANT". It turns out one has to be much more subtle than that, and approach slowly and peripherally. First, publish in specialist journals on the margins of development studies and work inwards from there. Second, don't mention ANT specifically and don't target the paper directly at introducing or evaluating ANT; instead bring in ANT as a way to help with a different focus. All this is part of the act of misdirection that seems necessary if ANT is to be introduced into development studies.

This latter is both surprising and disappointing given, for example, that the UK's Research Assessment Exercise panel – representing a major review of disciplinary outputs – commented, "in some instances the fine case material distinctive of Development Studies would gain from being explicitly related to issues of more universal policy or theoretical concern. Signal advances have been made in the theoretical analysis of topics … There is however, a strong current of research without obvious moorings in theory" (HEFCE 2009: 9).

Added together with the analysis above, the negative experiences in seeking ANT-rooted publication suggest that development studies may be insufficiently interested in both theory and practice. That's a problem for development studies generally, but also a problem for ANT-based work specifically.

3.2. The Relevance of ANT to International Development

We have dealt in Section 2.1 with potentially-valid criticisms of actor-network theory. Of the invalid ones, the most irritating is the notion that ANT is not relevant to current debates and issues in development studies. As will be argued below, actor-network theory is not simply a new tool to analyse all of development (new in the sense of new to development studies, not new to the world). It is also a perspective that resonates with new ideas in development studies. And it is a tool that is particularly appropriate for analysing what is new in development.

Relevance of ANT to Development Thinking

Dealing first with its conceptual relevance, actor-network theory fits with recent changes in development studies at three levels: the philosophical, the theoretical, and the analytical.

For much of its early history, development studies was – often implicitly – positivist in terms of its paradigmatic view of the world, realist in its ontology and modernist in its development philosophy: the phenomena of development were assumed to have some level of real existence, and – in the beliefs of modernisation – there was a single path ahead down which developing countries would follow their leaders in the industrialised world. The latter components were challenged by dependency theory, which saw the continuing underdevelopment of peripheral regions as a necessary concomitant of the development of core regions. However, both modernisation and dependency shared much in terms of their ontology, their concern with (albeit different) structures, and hence much of their understanding of what 'development' meant as a progressive structuralism.

Then post-modernism hit development studies, particularly during the 1990s, and challenged all of the foundations of the existing philosophy of development. This was constructivist rather than positivist in its research paradigm and relativist in terms of its ontology: "The key element of this approach is that, for post-modernists, development (and poverty) are social constructs that do not exist in an objective sense outside of the discourse (a body of ideas, concepts and theory) and that one can only 'know' reality through discourse" (Sumner & Tribe 2008:14). But this has also had its critics. Modernism in development studies was criticised for its naivety about the power of ideas and discourse to shape thoughts and actions. But post-modernism has been criticised for its obsession with texts, and for its "remoteness from the 'real world'" (Calas & Smircich 1999:659). In development, it is not so much 'post-development' as 'anti-development': "That the Third World is better off if it were not to reach development and modernity is, in a nutshell, the position taken in the postmodernist narrative" (Lieten 2002:80).

Though its strongest threads are still modernist and, to a lesser degree, post-modernist, development studies therefore faces a philosophical gap that criticisms have opened up between these two threads. Actor-network theory can make a stab at filling that gap. It clearly derives from the post-modern project, yet also differentiates itself to the extent we might attach the dread label "post-postmodern"[4]. It could be argued as post-structuralist given its denial of structure as causative, but it then diverges from typical post-structuralism because it is all about networks as structure (albeit as effects not causes) and because it is so rooted in people, things, practice. Where post-modern approaches are anti-essentialist and have a relativist ontology, we can argue that ANT borrows from modernism to rely on "the notion of inherent agential capacities" (Whittle & Spicer 2008: 614) and to hold what is closer to a realist than relativist ontology (Cordella & Shaikh 2006).

As Scott-Smith notes, ANT steers a new path just at the right moment to take development studies beyond the concerns of modernism and post-modernism. It "provides opportunities for some very illuminating analyses, which move us beyond the positivist search for objective truths but keep us more grounded than a purely

[4] As might be expected, ANT would likely reject such labels. If "we have never been modern" (Latour 1993) then it follows that "ANT rejects the entire distinction between premodernity, modernity, and postmodernity" (Ritzer & Goodman, 2004:598) and, hence, any notion of post-postmodernity.

post-structuralist analysis would allow. Such an approach is particularly welcome in development studies, which tends to be divided between the adherents of an economic approach that reduces the world to rational choice, and a post-development approach that reduces everything to discourse and culture". ANT is thus neither pro- not anti-development.

ANT also resonates with the recent step change in the role of theory within development studies. For much of its history, development studies was dominated by grand economic, social and political theories such as dependency, structuralism, modernisation (Sumner & Tribe 2008). But these big picture, prescriptive theories have given way in recent years to context-specific, descriptive micro-theories such as the sustainable livelihoods approach, which are "somewhat more humble" (*ibid.*: 85). Although it may have grand aspirations to be an alternative social science, actor-network theory fits with this flow – it is a "way of viewing the world" (*ibid.*: 83) from the perspective of the specifics of any individual context and, while it denies the notions of level, its descriptions reach down to the rich detail of development activities.

Finally, actor-network theory dovetails with new conceptual analytics in development studies. The theoretical turn noted just above has led development studies in recent years to be more interested in the specifics of development processes, rather than development structures (van der Ploeg 2006)[5]. This has particularly expressed itself in analysis of development actors and of the everyday practice of development. Thus, flowing from the actor-oriented understandings of development, we have detailed accounts of the activities of intermediaries or 'brokers' and their practice of interfacing between donors and development projects (Long & Long 1992, Vorholter 2012). Not only does ANT offer a frame for tracking actors and their practices – a specific lens for understanding practice as network formation – it also extends beyond the limitations of actor-oriented accounts by recognising that non-human entities, not just humans, are actors in development, and by finessing the rather awkward macro/micro hybridity of such accounts.

That recognition of the non-human also chimes with a growing interest in the materiality of development: in simple terms an assertion that the physical 'stuff' of development – machines, buildings, land, fauna/flora, bodies, documents – has been ignored and yet that it matters (e.g. Radcliffe 2005, Sneddon 2007). What actor-network theory again offers is a frame for understanding the material: an active framing of material items as actors, their placing within networks of interests, and a move beyond simple materiality to a socio-materiality of development.

Of course, actor-network theory is not an unknown stranger on a horse suddenly appearing in development studies' main street. Its ideas have influenced the emergence of some of the concepts and interests noted above (especially those on actors and practice within anthropology-of-development; those on materiality within

[5] Though, reflecting the experiences outlined in the box above, this turn has been slow, small, and unnoticed by some (reviewers!) in development studies.

development geography) and it draws from much wider trends in social science which in turn have flowed through development studies. Yet its particular conceptual fit has not been adequately recognised to date; nor – as discussed next – its fit to trends in practice.

Relevance of ANT to Development Practice

Actor-network theory fits well with current conceptual trends in development studies, helping address philosophical lacunae, theoretical shifts, and analytical interests. But ANT also has a practical relevance because it helps us understand emergent features of development.

We see an emergence in development of "complex dynamics; of a recognition that technological, social, economic and political processes ... interact in ways that are often nonlinear, involving multiple actors and scales from the most local to the global … Yet such dynamics have often been ignored in conventional approaches to development. Instead, one often finds research approaches, and especially applied policy and management, operating as if the world was stable, linear and predictable." (Leach *et al* 2008: 731, 734-5; see also Ramalingam 2013).

Those multiple actors mean that relatively simple, top-down development structures of the past centred on donors and governments, are being replaced by more complex patterns (Murdoch 2000). These may be horizontal forms that draw together approximately-peer organisations such as public-private partnerships, and/or vertical forms that cut across levels from the addition of community participation to insertion into global value chains. Whatever the case, development becomes a multi-stakeholder initiative involving networks of increasing complexity. Yet few theories brought to development studies have been adept at analysing this.

As described above, ANT is particularly good at offering a handle on such situations. Of course, it gives an insight into any form of network, however seemingly complex, and it particularly helps by removing the confusions of scale or level. The complexity triggers uncertainty and continuous instability. Again, this is ANT's forte because of its anti-determinism, and because it specifically incorporates the notion of networks in unceasing flux.

The second trend is that technologies – particularly information and communication technologies – are becoming ever-more deeply woven into development practice, just as they are into the fabric of society more broadly (Hanseth *et al* 2004). Development has always involved technology but the prevalence of technology and its integration into all aspects of development has taken a significant uptick during the 21st century. Even more than with networks and complexity, most theories used to date in development studies have abjectly failed to integrate technology into conceptualisation of development. They have practised a form of 'technological apartheid' that separates off consideration of technology from our understanding of development structures and processes. Actor-network theory solves this problem by

according technology neither non-status nor special status but equivalency with all actors, ensuring it is fully integrated into our understanding of development.

As with ANT's conceptual relevance, this is not pure coincidence – actor-network theory has emerged partly because of its relevance to real-world phenomena which impact development as much as any other sphere: "Actor-network theory has not arisen by chance at this particular point in history, but instead represents an attempt to address the increasingly complex socio-technical world in which we live" (Walsham 1997:477).

4. Applying Actor-Network Theory in Development Research

The preceding section provided some speculative insights about the contribution of actor-network theory to development studies. As noted above, prior work has moved beyond speculation to an actual application but this has been slightly tangential or peripheral to development studies, either in the extent of application of ANT or in its attempted engagement with the discipline.

In an attempt at a rather more direct encounter between theory and discipline, the initial working papers in this series were developed. They are summarised briefly below, in order to give an indication of content, and to enable the reader to form an initial judgement against the criteria for any theory: whether it tells us something credible, original, significant and useful about international development.

"***Facing the Dilemmas of Development: Understanding Development Action through Actor-Network Theory***" by Isam Faik, Mark Thompson and Geoff Walsham takes a broad perspective on development studies. It argues that development studies has been beset by a set of dualisms: around considerations of geography and space, time, and level of actors. Traditional conceptualisations of development tended to adhere to one end of the duality: a paradigm of things, global/macro scale, short-termism, and structure. More recent conceptualisations have adopted the other duality: a paradigm of people, local/micro scale, the long-term, and agency and process.

Those working in development studies are thus left with a "dilemma of reconciliation", either adopting one or other of the paradigmatic positions or trying to resolve what may be incommensurable positions. Actor-network theory, the authors argue, crashes through these dualities by obviating them. In terms of scale, ANT has a flat ontology: there is no micro within the macro because the core concept is the network which does not have size or level but intensity and strength. In terms of the duality of people vs. things, ANT's principle of symmetry moves us to an equalised socio-materiality in which all are actors. In a similar manner, ANT can dissolve dichotomies of time and structure/agency.

In this way, our whole ontology of development changes. ANT redraws our understanding of the reality of development from the dualities of the past to a new reality based on actors and networks, in which the key tensions are absence/presence of networks and of actors within networks, and of change/stability of those networks.

"***The Least Provocative Path: An ANT Lens on Development Project Formation and Dissolution***" by Tom Scott-Smith argues that we need a new perspective on the trajectories of development projects. Explanations of project success and failure must be derived not from some assumed and inherent value of projects, but in relation to the extent and durability of the network of alliances that projects create. In turn, the strength of those networks relies on three aspects: the extent to which elements of the network can be black-boxed such that they are taken for granted and their constitution no longer questioned; the extent to which the interests, identities and roles of actors can be translated into an aligned whole; and the involvement of material objects that help make networks more durable.

Scott-Smith applies this, using archival sources, to a past project in Nigeria that sought to make protein for human consumption from leaves. During the early years as the project appeared to be successful the 'three aspects' were supportive: both the problem and solution were black-boxed and not opened up for scrutiny and debate; scientists, donors, local beneficiaries, leaves and machinery were all translated into a cooperating network; and the latter non-human actants plus labels, bags and other devices all gave durable and material form to the project's interests. Conversely, project failure involved a reversal: the 'protein gap' problem and the leaf protein solution were increasingly opened up to challenge; actors left the network; and the leaves did not cooperate to produce an appetising source of protein. ANT thus prompts us to take a different perspective on projects – a "development associability" view – that pulls us far from traditional LogFrame-based approaches.

"***Re-Translating Nature in Post-Apartheid Cape Town: The Material Semiotics of People and Plants at Bottom Road***" by Henrik Ernstson challenges actor-network theory's habit of focusing on the powerful and of tracing the way in which they govern by creating and recreating subjects at a distance. Instead, and resonating with the challenges to apartheid's legacy, he seeks to explain how power can be built from the grassroots.

Like so many ANT-based accounts, this paper tells a good story – of how people, plants, land, machines, organisations, labour and other actors aggregated over time; how they built from a single house garden to an environmental movement. The paper argues that ANT therefore helps understand how the established order of expertise, of the Cartesian mapping of space, of the separation between nature and society, came to be challenged. And ANT provides further insights: into functional relations (how resources flow and perform certain actions); into epistemological claims (about the how/where/who of protecting biodiversity); and into ontological politics (with realities of nature, biodiversity, culture, oppression all bound up

together). ANT can therefore be seen to have a much wider applicability: providing insights into all circumstances in which oppression is and is not challenged.

"***Technological Change in Developing Countries: Opening the Black Box of Process using Actor-Network Theory***" by Richard Heeks and Carolyne Stanforth investigates the contribution that actor-network theory might make to the study of technology and development. It does this by characterising debate and competing understandings of technological change and development in five domains:

- Composition of technological change: contrasting linear, stage models with more complex, parallel/iterative models.
- Determinants of technological change: on which technologically-determinist views are silent but with variations from simple to more complex social structural-determinism in which there is some allowance for agency but in which individuals actors are missing.
- Treatment of technological change: in which research will often look at what affects this process, or at the structures that perform it, but in which the actual process of technological change itself is largely black-boxed without real detail.
- Level of process analysis: seeing a tendency to focus on one level.
- Nature of technology: with competing conceptualisations of technology as artefact, as system, as knowledge but always as acted upon, not acting.

Based on illustrative analysis of one technology change project using Callon's "moments of translation", the authors find ANT positioned in the following way in relation to the five domains:

- Composition of technological change: ANT is agnostic about the linear vs. non-linear duality.
- Determinants of technological change: ANT is neither technologically- nor socially-deterministic. Instead, in a reversal of the normal polarity, it sees process explaining structure rather than vice versa.
- Treatment of technological change: ANT opens the black box of technological change to provide rich detail about the dynamics of this process.
- Level of process analysis: ANT is agnostic about level, collapsing notions of macro and micro.
- Nature of technology: being an actor-network, each technology is in some ways a system when viewed through the ANT lens but, more significantly, it plays an active role in change.

Thus, while recognising there are limitations to the use of actor-network theory to understand technological change and development, the authors argue that ANT offers three unique insights. It describes process and explains structure; it recognises an active role for technology; and through the notion of translation it helps explain the micro-politics of technological change and the associated modification of goals, identities and interests.

"***Understanding Responsible Innovation in Small Producers' Clusters in Vietnam through Actor Network Theory***" by Jaap Voeten, Gerard De Groot, Job De Haan and Nigel Roome uses actor-network theory to push beyond existing conceptualisations

of innovation in development settings. One pivotal question is why some innovations diffuse and others do not. Institutional theory has been used to explain the behavioural constraints and enablers that act as people decide whether or not to adopt an innovation. Yet it can be seen to have limitations: it affords no role to the material objects that are part of all innovations, and it tends to take a rather atomised and static view of behaviour.

The authors demonstrate – using two cases of craft-related innovations in Vietnamese villages analysed via Callon's moments of translation – that actor-network theory can offer some new insights. It recognises the successful diffusion of any innovation as the mobilisation of a network of human and non-human actors who are translated to accept that innovation as means to realise their interests, and to take on the role of innovation adoption and use. ANT can help us to grasp the unplanned and dynamic nature of innovation, the learning that occurs during innovation diffusion, and the conflicts that lead some innovations to fail.

"***Challenging the Ontology of Technoscientific Artefacts: Actor-Network Theory in Developing Countries***" by João Porto De Albuquerque, Henrique Luiz Cukierman, Ivan Da Costa Marques and Paulo Henrique Fidelis Feitosa looks at the way in which technologies move from one world to another: from the global North to the global South; from the world of science to the world of society. In this movement, the technologies are often black-boxed; in the authors' terms, they are like an iceberg that arrives stabilised and fixed with the underlying processes that made them, obscured.

The paper then shows how an ANT-based sensibility can help unpack those processes, inverting the iceberg so that its foundations are visible. They do this by analysing the diffusion in Brazil of information and communication technologies within a particular welfare programme. Through an ANT lens, they follow the network of producers, users, commentators, technologies, and ideas which must coalesce if a technology is to successful diffuse; and which conflict for unsuccessful technologies. In this, ANT once again shows its ability to uncover the rich detail of development processes that can otherwise remain hidden.

"***ICTs and Social Movements under Authoritarian Regimes: An Actor-Network Perspective***" by Richard Heeks and Ryoung Seo-Zindy makes use of actor-network theory to throw new light on a particular fraction of development: the role of information and communication technologies (ICTs) in recent social movements such as the Arab Spring. It identifies a number of lacunae in much of the literature to date: limited conceptualisation, a strong divide between the technological and the social, simple association of cause and effect, limited treatment of agency including little or no agency attributed to the technology, and a tendency to focus on causes or impacts of ICTs associated with social movements while marginalising the dynamic processes of that association.

The paper uses Callon's moments of translation to analyse the trajectory of the Iranian Green Movement that protested the outcome of the 2009 election; tracing

the network of human and non-human actors as the Movement first grew and then largely disintegrated. It shows how technology facilitated this social movement, giving it a faster, greater reach than would otherwise have been possible. But it shows how ICTs simultaneously betrayed the network by also working for the Iranian regime and by enabling a shallowness of enrolment that hampered full mobilisation of the movement. ANT is thus seen to stand outside the dualities that have constrained prior research and to offer a rich descriptive insight into the process dynamics and agency of a developing social movement.

5. Conclusion

Truex *et al* (2006:797) offer four recommendations for those considering bringing a theory across from one discipline to another:

> "(1) consider the fit between selected theory and phenomenon of interest, (2) consider the theory's historical context, (3) consider how the theory impacts the choice of research method, and (4) consider the contribution of theorizing to cumulative theory".

We discussed above the issue of fit: ANT fits with both conceptual and practical trends within development, presenting a new(ish) lens to analyse all of development and a tool of specific value in analysing some particular new phenomena. While a number of critiques have been raised which will, for some, start to open a crack between theory and phenomena, we can argue these are not so great or so intractable as to keep ANT from flying at all. There has not been space to offer detailed guidance on research methods, but we have highlighted some aspects of this, and the individual working papers give greater insight into method.

ANT's historical context has been a chief difficulty. We must acknowledge where we are in the lifecycle of ANT more broadly, with a whole set of 'beyond/after ANT' writings. For example, where ANT focused on key actors, 'after ANT' looks at phenomena like complexity, failure, risk (e.g. Law & Hassard 1999, Gad & Jensen 2010). Where some disciplines have had a long and deep engagement following the launch of ANT and its subsequent creations, development studies has, by and large, missed the whole flotilla. So we face an odd moment in which development studies is just starting to apply ANT's basic ideas and approaches and literature to see if anything new or different emerges; as yet rather out-of-synch with broader ANT trends. We are thus unlikely to add much to the core cumulation of actor-network theory, but we can certainly add to the fraction of ANT as it applies to development.

Because of the historical moment, we are also likely to take a somewhat contingent and questioning approach to ANT in development studies; seeing ANT more as a provocation or a heuristic device. One can see the latter approach in a number of the papers where the authors, along with their readers, are seeing what ANT has to offer development studies without as yet an ideological commitment or confirmed adherence to the theory.

At least, though, this paper and those that follow in the series make a start on breaking into the chicken-and-egg problem identified earlier. They provide a foundation for use of actor-network theory in development studies. But this is only a foundation: where should use of ANT to analyse development go from here? In some ways the research agenda is limitless. As Tom Scott-Smith noted in an earlier draft of his paper:

> "One of the main characteristics of actor-network theory is its flexibility. It can be applied to concepts, institutions, and activities. Its use in development studies can therefore be directed at the very *idea* of development, at a particular development *institution*, or at individual *projects*."

Moving on from this we can identify specific development studies questions that ANT will be particularly good at addressing:

- What explains the trajectory of a development project?
- How does a particular development innovation (technical, socio-technical, social) diffuse and scale up, or sink without trace?
- What role have particular objects (technologies, animals, documents) played in a development process or project?
- How does power manifest itself in development processes? How are apparently relatively-powerless actors sometimes able to influence the direction of development? How are apparently relatively-powerful actors sometimes not able to get their way in a development initiative?
- How did a particular development policy or process or practice come about?

But a last word will go to one of ANT's progenitors, John Law, with an amended quotation (adapted from Law 1992: 389-390). Its first two paragraphs can be seen to set a research agenda for development; its final paragraph explains how ANT views development, but also how it may help towards a vision of more inclusive development:

> "What does actor-network theory have to say to the sociology of [development]? One answer is that it defines a set of questions for exploring the precarious *mechanics* of [development]. … Thus it is convenient to distinguish, on the one hand, between questions to do with the *materials* of [development], and on the other, with those to do with the *strategy* of [development]. So when actor-network theory explores the character of [development], it treats this as an effect or a consequence -- the effect of interaction between materials and strategies of [development].
>
> These, then, are the kinds of questions it asks of [development], and the powerful who head [development] organizations. What are the kinds of heterogeneous bits and pieces created or mobilised and juxtaposed to generate [development] effects? How are they juxtaposed? How are resistances overcome? How is it (if at all) that the material durability and transportability necessary to the organisational patterning of social relations is achieved? What are the strategies being performed throughout the networks of the social as a part of this? How far do they spread? How widely

are they performed? How do they interact? How it is (if at all) that … calculation is attempted? How (if at all) are the results of that calculation translated into action? How is it (if at all) that the heterogeneous bits and pieces that make up [development] generate an asymmetrical relationship between periphery and centre? How is it, in other words, that a centre may come to speak for and profit from, the efforts of what has been turned into a periphery? How is it that a [development] manager manages?

Looked at in this way [development] is an achievement, a process, a consequence, a set of resistances overcome, a precarious effect. Its components -- the hierarchies, organizational arrangements, power relations, and flows of information -- are the uncertain consequences of the ordering of heterogeneous materials. So it is that actor-network theory analyses and demystifies. It demystifies the power of the powerful. It says that, in the last instance, there is no difference in kind, no great divide, between the powerful and the wretched. But then it says that there is no such thing as the last instance. And since there is no last instance, in practice there are real differences between the powerful and the wretched, differences in the methods and materials that they deploy to generate themselves. Our task is to study these materials and methods, to understand how they realise themselves, and to note that it could and often should be otherwise."

References

Andrade, A.D. & Urquhart, C. (2010) The affordances of actor network theory in ICT for development research, *Information Technology & People*, 23(4), 352-374

Bell, F. (2010) Network theories for technology-enabled learning and social change: Connectivism and actor network theory, paper presented at *Networked Learning Conference 2010: Seventh International Conference on Networked Learning*, Aalborg, Denmark, 3-4 May

Bowker, G. and Star, S.L. (1999), *Sorting Things Out: Classification and its Consequences,* MIT Press, Cambridge, MA

Brooks, L. and Atkinson, C. (2004) StructurANTion in research and practice. in: *Information Systems Research*, B. Kaplan, D.P. Truex, D. Wastell, A.T. Wood-Harper & J.I. DeGross (eds), Academic Publishers, Kluwer Norwell, MA, 389-409

Calas, M.B. and Smircich, L. (1999) Post postmodernism? Reflections and tentative directions, *The Academy of Management Review*, 24(4), 649-671

Callon, M. (1986) Some elements of the sociology of translation: domestication of scallops and the fishermen of St Brieuc Bay, in: *Power, Action and Belief*, J. Law (ed.), Routledge & Kegan Paul, London, 196-233

Callon, M. (1987) Society in the making: the study of technology as a tool for sociological analysis, in: *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology,* W.E. Bijker, T. Pinch & T. Hughes (eds), MIT Press, Cambridge, MA, 83-103

Callon, M. (1991) Techno-economic networks and irreversibility, in: *A Sociology of Monsters: Essays on Power, Technology and Domination*, J. Law (ed.), Routledge, London, 132-161

Campregher, C. (2010) Shifting perspectives on development: an actor-network study of a dam in Costa Rica, *Anthropological Quarterly*, 83(4), 783-804

Cordella, A. & Shaikh, M. (2006) *From Epistemology to Ontology: Challenging the Constructed "Truth" of ANT*, Working Paper 143, Dept of Information Systems, London School of Economics

Cresswell, K., Worth, A. & Sheikh, A. (2011) Implementing and adopting electronic health records: how actor-network theory can support evaluation, *Clinical Governance*, *16*(4), 320-336

Donnelly, P.F. (2007) *Organizational Forming in (A)Modern Times: Path Dependence, Actor-Network Theory and Ireland's Industrial Development Authority*, PhD thesis, University of Massachusetts, Amherst, MA

Fornazin, M. & Joia, L.A. (2013) Understanding the dynamics of the implementation of a health information system in Brazil from the actor-network theory perspective, in: *Into the Future: Themes, Insights and Agendas for ICT4D Research and Practice*, proceedings of IFIP WG 9.4 12th International Conference, Ocho Rios, Jamaica, 535-550

Gad, C. & Jensen, C.B. (2010) On the consequences of post-ANT, *Science, Technology & Human Values*, 35(1), 55-80

Gasson, S. (2006) A genealogical study of boundary-spanning IS design. *European Journal of Information Systems* 15, 26-41

Greenhalgh, T. & Stones, R. (2010) Theorising big IT programmes in healthcare: strong structuration theory meets actor-network theory, *Social Science & Medicine*, 70(9), 1285-1294

Hanseth, O., Aanestad, M. & Berg, M. (2004) Actor-network theory and information systems: what's so special?, *Information Technology & People*, 17(2), 116-123

Heeks, R.B. & Stanforth, C. (forthcoming) Understanding development project implementation: an actor-network perspective, *Public Administration and Development*

HEFCE (2009) *Main Panel J Overview*, Higher Education Funding Council for England, London

Horowitz, L.S. (2012) Translation alignment: actor-network theory and the power dynamics of alliance in New Caledonia, *Antipode*, 44(3), 806-827

Latour, B. (1986) The powers of association, in: *Power, Action and Belief*, J. Law (ed.), Routledge & Kegan Paul, London, 264-280

Latour, B. (1987) *Science in Action: How to Follow Scientists and Engineers Through Society*, Harvard University Press, Cambridge, MA

Latour, B. (1991) Technology is society made durable, in: *A Sociology of Monsters: Essays on Power, Technology and Domination*, J. Law (ed.), Routledge, London, 103-131

Latour, B. (1993) *We Have Never Been Modern*, Harvester Wheatsheaf, New York, NY

Latour, B. (1996a) *Aramis, or The Love of Technology*, Harvard University Press, Cambridge, MA

Latour, B. (1996b) On actor-network theory: a few clarifications. *Soziale Welt*, *47*(4), 367, 369-381

Latour, B. (1999) On recalling ANT, in: *Actor Network Theory and After*, J. Law and J. Hassard (eds), Blackwell, Oxford, 15-25

Latour, B. (2005) *Reassembling the Social: An Introduction to Actor-Network-Theory*, Oxford University Press, Oxford

Law, J. (1986) Power/knowledge and the dissolution of the sociology of knowledge, in: *Power, Action and Belief*, J. Law (ed.), Routledge & Kegan Paul, London, 1-19

Law, J. (1992) Notes on the theory of the actor-network: ordering, strategy, and heterogeneity, *Systems Practice*, 5(4), 379-393

Law, J. (2002) *Aircraft Stories*, Duke University Press, Durham, NC

Law, J. (2007) *Actor Network Theory and Material Semiotics*, Centre for Science Studies, Lancaster University, UK http://www.heterogeneities.net/publications/Law2007ANTandMaterialSemiotics.pdf

Law, J. & Callon, M. (1992) The life and death of an aircraft: a network analysis of technical change, in: *Shaping Technology/Building Society*, W.E. Bijker & J. Law (eds), MIT Press, Cambridge, MA, 21-52

Law, J. & Hassard, J. (eds) (1999) *Actor Network Theory and After*, Blackwell, Oxford

Leach, M., Sumner, A. & Waldman, L. (2008) Discourses, dynamics and disquiet: multiple knowledges in science, society and development, *Journal of International Development*, 20, 727-738

Lewis, D. & Mosse, D. (2006) *Development Brokers and Translators*, Kumarian Press, Bloomfield, CT

Lieten, G.K. (2002) Faltering development and the post-modernist discourse, *Social Scientist*, 30(7/8), 67-83

Long, N. & Long, A. (eds) (1992) *The Battlefields of Knowledge: The Interlocking of Theory and Practice in Social Research and Development*, Routledge, London

Miettinen, R. (1999) The riddle of things: activity theory and actor-network theory as approaches to studying innovations, *Mind, Culture, and Activity*, 6(3), 170-195

Mitev, N. (2009) In and out of actor-network theory: a necessary but insufficient journey, *Information Technology & People*, 22(1), 9-25

Mitev, N. & Howcroft, D. (2011) Social shaping of technology, and actor-network theory, in: *The Oxford Handbook of Management Information Systems*, R.D. Galliers & W.L. Currie (eds), Oxford University Press, Oxford, 292-322

Mosse, D. (2005) *Cultivating Development*, Pluto Press, London

Murdoch, J. (2000) Networks – a new paradigm of rural development?, *Journal of Rural Studies*, 16(4), 407-419

Radcliffe, S.A. (2005) Development and geography: towards a postcolonial development geography?, *Progress in Human Geography*, 29(3), 291-298

Ramalingam, B. (2013) *Aid on the Edge of Chaos*, Oxford University Press, Oxford

Ritzer, G. & Goodman, D.J. (2004) *Sociological Theory*, 6th edn, McGraw-Hill, New York, NY

Rottenburg, R. (2009) *Far Fetched Facts*, MIT Press, Cambridge, MA

Sneddon, C. (2007) Nature's materiality and the circuitous paths of accumulation: dispossession of freshwater fisheries in Cambodia, *Antipode*, 39(1), 167-193

Stanforth, C. (2006) Using actor-network theory to analyze e-government implementation in developing countries, *Information Technologies and International Development*, 3(3), 35-60

Stanforth, C. (2009) *Networks of Influence*, PhD thesis, IDPM, Faculty of Humanities, University of Manchester, UK

Star, S.L. (1989), The structure of ill-structured solutions: boundary objects and heterogeneous distributed problem solving, in: *Distributed Artificial Intelligence, vol. II,* L. Gasser & M. Huhns (eds), Pitman, London, 37-54

Star, S.L. (1991) Power, technologies and the phenomenology of conventions: on being allergic to onions, in: *A Sociology of Monsters: Essays on Power, Technology and Domination*, J. Law (ed.), Routledge, London, 26-56

Sumner, A. & Tribe, M. (2008) *International Development Studies: Theories and Methods in Research and Practice*, Sage Publications, Los Angeles, CA

Truex, D., Holmstrom, J. & Keil, J. (2006) Theorizing in information systems research: a reflexive analysis of the adaptation of theory in information systems research, *Journal of the Association for Information Systems*, 7(12), 797-821

van der Ploeg, J.D. (2006) Structure and agency, in: *The Elgar Companion to Development Studies*, D.A. Clark (ed.), Edward Elgar, Cheltenham, UK, 607-612

Vorholter, J. (2012) Studying developing organizations, *Journal of Organizational Ethnography*, 1(2), 178-191

Walsham, G. (1997) Actor-network theory and IS research: current status and future prospects, in: *Information Systems and Qualitative Research*, A.S. Lee, J. Liebenau & J.I. DeGross (eds), Chapman & Hall, London, 466-480

Whittle, A. & Spicer, A. (2008) Is actor network theory critique?, *Organization Studies*, 29(4), 611-629

Williams-Jones, B. & Graham, J.E. (2003) Actor-network theory: a tool to support ethical analysis of commercial genetic testing, *New Genetics and Society*, 22(3), 271-296