Do Non-humans Make a Difference? The Actor-Network-Theory and the Social Innovation Paradigm

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Abstract Social innovation is becoming a widely used term in international debates in the context of social challenges. Neither in political nor in social scientific discussion there seems to be a consensual definition or concept of social innovation. In search of a sociological understanding of social innovation this paper turns to Latour's Actor-Network-Theory (ANT).

Latour is known for his insistence on the role of non-humans (which usually refers to technological artefacts) in society and how the reference to non-humans changes our understanding of social action and structure. In his view, the "social" is nothing but a type of relation, it is the way human and non-human actors link to each other, are translated and form actor-networks in a "flat" world without a "context" or "macro-level". As a consequence, we cannot separate technological artefacts from the "social sphere" of humans anymore. Furthermore, Latour and Callon introduced a variety of general concepts that allow to empirically study this world of relations and translations.

This article discusses the potentials in applying Latour's version of ANT to social innovation following two main questions: Does ANT provide empirical tools appropriate for analyzing innovation processes that do not have technology as their main driver and output? Does ANT help us to conceptualise social innovation in a way that avoids the exclusion of technical artefacts per se?

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H.-W. Franz et al. (eds.), *Challenge Social Innovation*,
DOI 10.1007/978-3-642-32879-4_4,

1 Introduction

"Social innovation" is currently promoted by the European Commission, governments (in particular in the UK and US), umbrella organisations, research organisations and NGOs worldwide.[1] While the concept of social innovation (or similar concepts such as social invention) is not entirely new (Zapf 1994), there is still no broad consensus about its exact meaning and scope. Sociology is still trying to catch up in reflecting and situating the recent development. There is no established theoretical and empirical framework for the definition and study of social innovation. In this article we would like to contribute to this challenge in relating social innovation to a relatively new sociological theory – the actor-network-theory (ANT) – originally developed by the French sociologists Bruno Latour and Michel Callon (Callon and Latour 1981; Latour 1987). Establishing this connection has to be considered a theoretical experiment rather than an attempt to actually provide a framework theory for social innovation. The experiment, however, also offers insights to the study of innovation in general.

We are going to do two things: Firstly, we would like to show how concepts of ANT may be used to study innovation processes and in particular aspects of innovation that mainstream sociology would identify as the "social aspects" of innovation. It is clear that the initiatives which are commonly regarded as social innovations such as micro-finance, complementary currencies or alternative education programmes certainly include "technology" in a different way than R&D intensive business innovations aiming at developing a technological product. "Technology" in these examples of social innovation is used on a rather rudimentary level and is often not the main driver or output of the innovation process. We will see however that Latour – although coming from laboratory studies – is actually not primarily concerned with high-tech in his theory. High-tech is just one of the most visible manifestations of technology in innovations processes – but as we will show his theory clearly goes beyond that. It is rather concerned with the interrelatedness of human and non-human, primarily technological artefacts as a

[1] **European Union:** In 2009 the bureau of European policy advisers (BEPA) organised a workshop on social innovation with an expert meeting together with EU president Barroso: http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/81&format=HTML&aged=0&language=DE&guiLanguage=en

Great Britain: The National Endowment for Science, Technology and the Arts (NESTA) funds and implements different programmes for the support of national innovation capacity, among these are also programmes on social innovation: http://www.nesta.org.uk.

The Young Foundation is a social innovation incubator and research centre: http://www.youngfoundation.org.uk/.

Social Innovation Exchange (SIX) is a platform for social innovation in Europe: http://socialinnovationexchange.org/.

United States: Under President Obama the White House established an "Office of Social Innovation and Civic Participation" see: http://www.whitehouse.gov/administration/eop/.

Social innovation centres exist in Canada, Denmark, Australia, Austria, Spain and other countries.

fundamental characteristic of society or the collective, as Latour calls it, as a whole. This is exactly why we think that it makes sense to experiment with Latour's concepts when studying less technology-focused forms of innovations.

Secondly, in the course of this text, we develop the argument that Latour's perspective may prevent us from making a mistake in the definition and conceptualisation of social innovation. The "social" in social innovation suggests making a difference between technological or business innovations and social innovations and to look for the "social dimension" of innovation. In doing so, the sociological meaning of "social" in terms of interaction and communication becomes (often implicitly) linked with the colloquial use of the word: taking care. Social innovation may then be seen primarily as a human-to-human interaction, free from technological aspects and business motives, only focused on the common good. This not only seems to be a naive image of social innovation, it may also be a "strategic" mistake. It would separate social innovation from core areas of society, their resources and their problems. In reminding us that technology cannot be separated from the "social" Latour may help us to find a better conceptualisation of social innovation.

2 Introduction to Actor-Network-Theory

Initially, Latour came forward with two key insights which are simple and provocative (or provocative because they are simple) and stem from his field research on the production of scientific knowledge in labs in the 1970s and 1980s before and while he was working for the Centre de Sociologie de l'Innovation at the École des Mines in Paris. The first insight is that, according to his studies, scientific facts are constructed rather than discovered. The second insight, more relevant to us here, translates into a methodological premise: It is necessary to include non-human actors in sociological explanations and not to distinguish ex-ante between human and non-human actors. Both humans and non-human artefacts have the potential for agency. What Latour does here is, in his own words, to generalise and fully realise the symmetry principle of the "strong programme" of the Edinburgh school of science studies (Bloor 1991/1976) which stated, among other things, that both knowledge considered true and knowledge considered false needs explanation and that these explanations should be developed using the same set of methods.

Later in his career, Latour developed these assumptions further into a critique of modernity whose main argument is the following: To be modern would mean to simultaneously advance two "ensembles of practices" (Latour 2008, 19) without being aware of it: first, practices creating "hybrids" of nature and culture ('translation'); secondly, practices creating ontologically separate spheres of human and non-human beings ('purification'). One of Latour's hypotheses is that modernity forbids to think of hybrids while, at the same time and because of this prohibition, the pace of their generation is accelerated. As soon as we start to *look* at both practices – translation and purification – simultaneously, we stop being modern and we stop "having been modern", for we understand that both practices

have never been separate in the development of society. In this new perspective, what we formerly referred to as the "human society" becomes a collective of humans and non-humans. The interrelation of human and non-humans and their "exchange of qualities" is for Latour a main driver of societal development (cf. Latour 1994).

To understand what a "hybrid" is, we need to follow Latour a bit further in his argumentation. As indicated, we are most interested in the methodological premises advocated by Latour, who states that we should include non-humans in sociological explanations and, what is more, free us from the habit of ontologically separating human actors and non-humans at the outset. In one of his key articles (1992), Latour presents the following example to illustrate what he aims at: He describes a hotel with guests and a manager. Upon leaving the hotel, the guests tend to take their keys with them, which leads to problems if, for instance, they lose the key. A sign at the reception stating that guests should leave their key as well as the hotel manager's verbal indications do not trigger the result of the guests leaving their key at the reception. Then there comes an innovation: a metal weight is attached to the keys. Suddenly, the guests do not want to carry their key along as they are heavy and do not fit well into pockets. They return the keys at the reception when leaving the hotel. "Where the sign, the inscription, the imperative, discipline, or moral obligation all failed, the hotel manager, the innovator, and the metal weight succeeded" (ibid.: 104).

With this example, Latour aims to demonstrate several things: First, the metal key weight is an actor in this constellation. Only its appearance in the network of other actors made a difference; Latour's definition of the actor is precisely: everything that "makes a difference" (Latour 2007, 71). Moreover, another key principle of Latour's approach becomes clear: an innovation never proceeds only because of its inherent qualities or some kind of essence. "[T]he force with which a speaker makes a statement is never enough, in the beginning, to predict the path that the statement will follow. This path depends on what successive listeners do with the statement" (Latour 1992, 104). In Latour's terms, the 'programmes' (or programmes of action) of the speaker and listeners must allow both sides to meet and carry on with the statement. All elements involved, the statement, the speaker and the listeners, are transformed along the process. The hotel manager is no longer the same after the key weight is introduced (he is no longer desperately reminding guests to leave the keys), the guests are transformed (they leave the hotel in different ways, feel the need to minimise the time spent with the key weight in their bags) and the key is transformed (has changed from an artefact disappearing in bags and pockets to a clumsy thing that one wants to get rid of). "[T]he order that is obeyed is no longer the same as the initial order. It has been translated, not transmitted" (ibid.). In these translations, humans and non-humans '*associate*' in chains of different kind and length (cf. ibid.: 105ff), chains whose elements co-constitute each other and form actor-networks. Chains are embedded in other larger chains, actors made up of actor-networks. It is rather a methodological necessity than an ontological possibility to define the limits of the chains of interest. Elements within the chain of associations can be substituted, modifying the chain and type of network. Thus, the "hybrid" is an assemblage of humans and

non-humans, created through the exchange of qualities and programmes of action. The case of the key weight is obviously a very simple one, but we may also think, for instance, about hybrid assemblages comprising electric grids (including power plants, social and spatial configurations, etc.). We then can imagine the vast extension of hybrid actor-networks and the way they shape the collective.

3 Does ANT Make a Difference? ANT in the Context of the Sociology of Technology

What could have been a friendly reminder to sociology to re-integrate non-humans, completely changed Latour's understanding of sociology, the social and sociological explanations, which led him to emphasise the discontinuity between his approach, Actor-Network-Theory, and the "sociology of the social" by which he describes mainstream sociology before ANT. We will shortly explore how much continuity and discontinuity there actually is, trying to elaborate the main arguments that may set ANT apart from other positions, continuing with the question whether these assumptions may help us to study innovation processes.

The sociology of technology is a well established field of social scientific research with a considerable body of literature that poses the question of the role of technology in society the capacity for agency of non-human artefacts. When it comes to the German discussions in this field, Werner Rammert, in the anthology with the title "Do machines act?" (Rammert and Schulz-Schaeffer 2002), provides a systematic overview on theoretic positions in the field of the sociology of technology. As a result, Rammert classifies positions by cross-tabulating selected variables. The main differences between theoretic approaches are defined by (1) either a normative (capacity of agency is theoretically postulated) or descriptive (capacity of agency is empirically described) stance; (2) by choosing either an attributive (How do humans ascribe agency to non-humans?) or quality-related approach (In which ways are humans and non-humans capable of acting?) and (3) by the question whether agency is only attributed to advanced non-humans (artificial intelligence) or to all non-humans (including Latour's famous key weight). The diagram below only shows the categories of the resulting matrix and the positions attributed to ANT theorists.

Theoretical approach	**Any technological artefact has the capacity for agency OR only advanced technological artefacts**	*Agency of technological artefacts is a result of attribution*	*Agency of technological artefacts is an observable quality*
Descriptive	*Any technology*		"Actants" (Callon, Latour)
	Advanced technology		
Normative	*Any technology*	Generalised symmetry (Latour)	
	Advanced technology		

Source: Rammert and Schulz-Schaeffer (2002) (adaptation and translation by the authors)

Interestingly, Latour appears in two cells of the matrix: "Normative"/"Any technology"/"Agency as attribution" would mean that Latour theoretically postulates that all non-humans are actors (have the capacity for agency) and that this is the result of attribution (by the theorist?). "Descriptive"/"Any technology"/"Agency as quality" would mean that the capacity for agency can in general be empirically described for any non-human as an observable quality.

We think that this assignment, in being somewhat inconsistent, reveals relevant difficulties in understanding Latour's positions that may also be caused by his shifts in the use of ANT terms and different formulations of main assumptions. We think that Latour actually occupies many of the cells presented therein, although not without significantly changing the meaning of the descriptions used. According to Latour, the principle of "generalised symmetry" is not determining the capacity for agency of non-humans or humans (and is therefore not normative in Rammert's sense). It does not say that humans and non-humans act the same way or that non-humans would act intentionally. Latour is not interested in determining empirically whether the key weight or the artificial intelligence acts "causally", "contingently" or "intentionally" and to which degree, which is Rammert's own proposal for a "gradual theory of agency" (Rammert and Schulz-Schaeffer 2002, 39). Latour focuses instead on the interrelations between humans and non-humans, the exchange of non-human and human qualities and the way humans and non-humans co-constitute the collective (Latour 1994, 46ff). Humans can extend their intentionality to a key weight and in doing so they become part of actor-networks that will change themselves in transferring non-human qualities back to them (maybe also changing the structure of their intentionality). Thus, Latour definitively would not say that non-humans act in a specific way – only that they potentially may become actors anytime.

Latour is "descriptive" in making the assumption that we can observe or at least empirically trace the interrelation between actors, respectively the process of an actant, i.e. an actor who "has no figuration [as a specific character in a story] yet" (Latour 2007, 71), becoming an actor. This also means that the empirical description of the "capacity for agency" of humans and non-humans will change with the case at hand. We cannot validate the capacity for agency of non-humans once and for all – neither empirically nor theoretically. We actually never know what a non-human or

human is capable of doing, because it depends on their figuration. The name "Actor-Network-Theory" is the best hint that Latour does not intend to describe isolated humans or non-humans: Action is distributed among actors, across space and over time (Latour 1994, 40ff). Action is only manifested as an actor-network.

Latour is furthermore concerned with attribution, because in his ethno-methodological approach (cf. Latour 1999a, 19) he often depends on the account of humans who tell the researcher to which non-humans they are related in which ways. The researcher then can use the meta-language of ANT to trace these interrelations. This means that Latour is interested in attribution as a methodological necessity, but not in the sense that he would only be concerned about how humans attribute agency to non-humans – he goes beyond that in describing the actor-network itself and not just the attribution.

4 Deploying Selected Concepts of ANT for the Analysis of Social Innovations

In the preceding chapter, we have introduced the theoretical framework of ANT and contextualised it by presenting limited parts of the discussions surrounding it. Now we would like to pick a series of concepts developed within ANT that we consider useful for the analysis of innovation processes. One of their major advantages seems to be that no ex-ante discrimination is necessary between those forms of innovation involving (or focussing on) technological artefacts and those forms not involving or not primarily aiming at artefacts. This allows us to look at innovation from a formal perspective as the creation of new actor-networks that are, in the accounts of the human actors, linked to intentional change.

One of the general and key characteristics of innovation processes is that they involve new entities or new combinations of entities, that is, in ANT terms, evolving associations of mediators to chains and actor-networks. The overarching term for describing these processes is "translation". Translation is understood as "[a] relation that does not transport causality but induces two mediators into coexisting" (Latour 2007, 108). The mediators induced into coexistence can be human or non-human. Again, this distinction does not matter to Latour. More important is that the associated mediators exchange qualities and change in the process. The result is a new actor, an actor-network which is somehow more than the sum of the components. It's not "only" a network of actors, but an actor-network. Latour (1999b) offers the example of the gun and the man. It is not very useful to think about the actor quality of a "gun" and the actor quality of a "human" per se, when the actor of interest is the "human with a gun" – a non-human and human hybrid that transformed the action programme of the "human" and the "gun" into something different (different aims, different means, different effects). This process does not start with the "human" taking up the "gun", but starts with the problem of "how to kill people" and with substituting step-by-step bare hands with technology. The "human with a gun" is only the last manifestation of this

far-reaching process of human and non-human interrelation and exchange which Latour calls "translation".

Michel Callon, in his elaboration of the Sociology of Translation (1986), defines four overlapping phases or "moments" of the process of translation which involves the negotiation and demarcation of the actors' identity as well as the possibilities for interaction and agency.

The first moment is called *problematisation* and involves, as a part of it, the definition of a so called "obligatory passage point": Our sociological observations always start by looking at given actors (there is no moment in time "before" any actors are in place) and their construction and deconstruction of nature and society. Accepting this as given, we can look at a set of actors (e.g. scientists working on a specific topic) and will see that they, in tackling a problem of relevance to them, define (in written documents, verbal exclamations, gestures) a set of other actors (colleagues, study objects, etc.) and their identities and try to involve these actors in their programmes of action (e.g. a certain research project). The actors do not limit themselves to identifying other actors. They also try to show that it is in the interest of the latter to participate in their programme of action. They construct a story showing that they themselves and the other actors must come together (at an obligatory passage point) in order to solve a specific problem at hand, reach a specific goal, etc.

The second moment in the process of translation, *interessement*, has to do with the virtual and hypothetic nature of every problematisation. The "other actors" called upon in the problematisation of a set of actors can accept or refuse to join the programme of action (also non-human actors can accept or refuse: In Callon's example of scientists and their study objects, the latter refuse, for instance, when their integration into a laboratory setting for experiments fails). However, there are strategies at hand for the group of actors to convince the other group. *Interessement* is, thus, the group of activities through which one entity of actors tries to define and stabilise the identity of another group of actors.

Interessement can lead to *enrolment* but does not have to. If it does, then enrolment does not imply a set of pre-defined roles the actors called upon can occupy. Rather it denotes the negotiation process within which related roles are defined and assigned to actors who accept them (or not). Along the process, the actors whose programme of action engages other actors, are continually transformed as is their programme of action.

The last phase in the process of translation is *mobilisation*, where the question who is a representative speaker for whom is negotiated and settled. It is the collective of an actor's translation efforts which defines his or hers (or its) programme of action (cf. Belliger and Krieger 2006).

What we want to show with this short presentation of main concepts of the Sociology of Translation is that the concepts can be applied empirically and offer an analytical benefit. In looking at innovation processes, they can help to identify moments along the way where a certain group of human or non-human actors calls upon another group of human or non-human actors to join the process. The latter group can accept or refuse, become enrolled or not, act as a speaker or representative for other actors or not.

A differentiation Latour (2007) proposes to explain the dynamics of actor-networks is that between *mediators and intermediaries*. Intermediaries transport meaning or force without transformation. Defining an input is enough to anticipate the output. Mediators, by contrast, transform, translate, distort and modify the meaning or the elements they are supposed to carry. Input is not a good predictor for output, in the case of mediators (ibid., 39). We have stated that in innovation processes mediators become associated. During this association, both ends of the association experience a transformation. They are translated, not simply connected or transported. Chains of associations get complex not only from an observer's perspective but also from the actors, forming part of them. There is a need to stabilise parts of the chain of associations so that actors can rely on getting a stable output when providing the same input. Mediators or groups of mediators are transformed into intermediaries or groups of intermediaries. This process is called *black-boxing* (cf. Latour 1994). Parts of the chain get black-boxed and, for a while, the other actors involved do not have to bother about them. However, a black-box can always be opened; the process of black-boxing is reversible.

The construction of machines, the training of lab assistants and the definition of experimental setups are examples of processes of black-boxing. Someone has developed laptop and beamer technology in complex actor-networks over considerable amounts of time. Nevertheless, I can engage with an audience, a laptop, a beamer and a subject in the setting of an academic presentation. As long as the laptop and the beamer do not break down, the process of transforming codified knowledge input (the presentation) into visually available information (the image on the wall) is black-boxed and I as a speaker do not have to bother about it (neither does the conference programme, whose time schedule might be distorted).

These steps of black-boxing and opened or broken black-boxes are crucial and of relevance for empirical studies of innovation. For instance, in developing a local currency, at some point, the currency might be available as physical paper money which a certain number of people in my village, region, etc. accept as a medium of exchange. The task of negotiating and explaining the meaning of the regional currency, explaining how it becomes and holds its value, etc. is black-boxed and I only have to bother if someone questions the validity of the regional currency.

This relates to yet another ANT concept, which we consider useful for the analysis of innovations: *inscription* (Akrich 1992). ANT theorists understand as inscription the work of assigning and inscribing specific visions of the world into objects or relations between objects, humans or humans and non-humans. Following a specific *problematisation*, their views of the world and their surrounding, actors inscribe these views into the relationships they enter and develop, the things that they produce, etc. The results are "scripts". Akrich focuses more on technical objects, here, and states that the visions of an innovator or designer are embodied in the results of the innovation and design. They are thus not completely open for interpretation and use, but can be used and interpreted in certain ways. Other actors can "subscribe" to them or "de-inscribe". Inscriptions also "prescribe" demands to other actors. Again, they can accept and subscribe or revolt and de-inscribe. By contrast to these concepts describing the action and reaction of other actors, Akrich proposes the notion of "de-scription" as the

analysts' work of deciphering inscriptions. While Akrich focuses very much on the relationship between designers and innovators on the one hand and technical objects on the other, we believe that inscription work is also relevant for the action of human actors towards other human actors: the type of relationships an actor or group of actors aspires to is guided by visions of the world just as this group's design of an artefact would be.

For us, empirically, it is a concept which sensitizes to acts of transfer of meaning from one actor to the other and, more broadly speaking, to the negotiations of the meaning of certain innovations. The concept is related to the first phases of the process of translation. When actors aim to inscribe meaning into other actors and relationships, the latter can accept or defy these meanings and attributions, they can become "interested" and "enrol" or not.

With this conceptual toolbox at hand, we will now re-visit an empirical case of a, so to speak, traditional technology and market-oriented innovation to see what we can gain out of ANT for the understanding of the social process of innovation.

5 Re-analysing an Empirical Case: The Van de Ven et al. Study of 3M

In their empirical and theoretical innovation research, Van de Ven et al. (2008) contradict the conventional image of innovation and come to the conclusion that innovation processes are characterised by non-linear, chaotic dynamics. The research of Van de Ven et al. was based on comprehensive, decades-long case studies accompanying potential innovation processes from their beginning in the late 1970s to their final success or failure in the 1980s and 1990s. After this field research, Van de Ven et al. tried to systematise their findings on innovation processes in a series of books with "The innovation journey" being their latest major publication (ibid.).

One of the most impressive accounts given by Van de Ven et al. of a commercial innovation initiative is the case of the 3M company and its attempt to introduce the first cochlear implant (a device enabling deaf persons to hear partially) into the market (ibid.: 223ff.). The 3M case shows how a completely rationally framed endeavour (large industrial infrastructures and resources, professional management, strategies, time plans, milestones, research units etc.) develops more and more complexity in often unintended ways: doors of opportunities open and close again, networks build up and fragment, people are hired and fired, technological trajectories develop in unanticipated ways, cooperation partners turn into competitors, new players appear and "change the game", institutional contexts impose restrictions or become themselves the object of competitive strategies etc.

The studies by Van de Ven et al. predominantly portray innovation processes as "social processes" in the conventional sense of human-to-human interaction respectively organisation-to-organisation interaction. Although they are not primarily interested in re-constructing the relations between non-human and humans, their

accounts are detailed enough to comprise plenty of information on technological artefacts and their "role" in the innovation process. Van de Ven et al. used "events" as their unit of analysis when studying these cases, which were coded to be used for quantitative statistical analysis showing the co-occurrence of different types of events or more complex, multidimensional event-landscapes. We decided to use the 3M case primarily because of the detailed chronology of events that Van de Ven provide and because of the dominance of "social processes" in Van de Ven's account to re-analyse selected parts with the instruments of ANT.

The moment where Van de Ven et al. "enter" their empirical case[2] is a phase they call initiation and which is characterised by interactions between 3M and a number of other organisations like the University of Melbourne, Audiotronics California Corporation, the House Ear Institute etc. In ANT terms, what is happening here is best described with the concept of *translation* and its various phases.

3M follows a specific programme of action (which is not something they simply adopted at some point but has its own history[3] and interdependencies) where the fact that the company considers cochlear implant technology as a promising project plays a key role. From that point on, 3M initiates a search for ongoing activities in the United States in this sector and identifies a number of actors (the mentioned organisations but also existing technologies, etc.) with which it enters into negotiations. 3M, in ANT terms, develops a *problematisation*, writes a story where other actors play different roles, defines these roles (e.g. as a partner, as a to be acquired part of 3M, etc.) and establishes an obligatory passage point or, actually, a series of passage points all of which, in the view of 3M, have to be passed by a certain assembly of actors at a certain point in time. One of these passage points, for instance, is recorded as 3M engineering arguing that the company "is losing a golden opportunity in single-channel systems by not finalizing an agreement with [i.e. selling implants to] HEI [the House Ear Institute]" (Van de Ven et al. 2008, 278). In this view, HEI is considered as an actor, is assigned a role, and it is stated that 3M and HEI have to pass through the point of a formal sales agreement in order to meet their respective needs (the need of 3M to sell the implants and make money; the need of acquiring implants of HEI). The strategies of *interessement* employed by 3M are not documented. However, what we can see from the empirical material is that some of the actors who 3M approached with the story and the proposed role distribution *enrolled* and others didn't. For instance, 3M and the University of Melbourne could not reach an agreement over cooperation. The University of Melbourne instead enrolled in another programme of action by the Australian Department of Productivity, which extended funds under the condition that the cochlear device would be developed indigenously by the University in Australia.

[2] It also becomes clear from analyses like Van de Ven et al. (2008) that innovation processes have no clear beginning nor end.

[3] Again: no clear beginning.

Along the complex innovation processes around the cochlear implants, with different generation devices and different groups of associated mediators, 3M has to deal repetitively with the US' Food and Drug Administration (FDA). The FDA has to approve the respective versions of the device and the negotiations with FDA figure prominently in the accounts of Van de Ven et al. The dealings of 3M with FDA are recorded as such that the company on several occasions "provides inputs" (e.g. to shape FDA guidelines), "informs FDA" (e.g. about the "remarkable results achieved"), "organises" (e.g. a seminar for FDA staff), etc. (Van de Ven et al. 2008, 281). While Akrich's (1992) concept of *inscription* is proposed for innovators and designers inscribing their views of the world into the artefacts they develop, we believe that it is pertinent to apply the notion here and that this application even offers feedback to the conceptual underpinnings of ANT: In Akrich's usage, the term inscription introduces or presupposes a clear separation between the inscribing actor and the rather passive object something is inscribed into. In the case of the FDA guidelines, it is not so clear who the inventor or innovator is. FDA has some responsibility, but at the same time 3M tries to inscribe its own visions of the world into the guidelines. What is invented is no artefact in the narrow sense, but a regulation codified in an artefact, which is relevant for 3M's dealings, i.e. an actor incorporating other actors' visions and, in turn, shaping these actors' views.

The example of the FDA guidelines suggests to look at another term of ANT's conceptual space, this time linked to Latour: form. "A form is simply something which allows something else to be transported from one site to another. Form then becomes one of the most important types of translation. [. . .] It can be a paper slip, a document, a report, an account, a map" (Latour 2007, 223). The FDA guidelines as a form can be seen as transporting a decision (to accept or not accept certain devices) from a concrete physical site to potentially unlimited sites of other actors developing similar devices. Only if they want to contest the guidelines do they need to approach the original site of the negotiations of the form. The specification of a form as a type of translation is interesting: The FDA guidelines incorporate a problematisation, define actors and their roles. Its strategy of interessement is to be out there and approach all other actors that want to engage in cochlear implant development. These actors can choose to enrol to the guidelines' programme of action or contest it.

In a way, in its acting as a type of translation, the guidelines define a new group of actors: those potentially developing cochlear implants. This group has not existed as such before the form of the guidelines was in place. We find other examples of new groups of actors shaping in the course of the fragmented process of innovation when looking at Van de Ven et al.'s documented data: There is a moment where 3M is suggested by FDA to look at a device for children. With this problematisation, a new actor or actor group appears on stage: children with hearing difficulties. At this point in time, it is not clear yet whether the new group of actors will enrol into the programme of action (would they accept wearing a specific type of cochlear implant? etc.), nor is clear who speaks for them. However, they started to exist as an actor "making a difference" for 3M's development of cochlear

implants. The extension of the target group for cochlear implants from deaf people to the residual hearing population is a similar case.[4]

In the end, 3M's innovation initiative dissolved – the establishment of a new and stable actor-network failed, because too many intermediaries turned to mediators that behaved in unexpected ways rendering the rational planning of 3M ineffective. Finally, 3M had no other option than to sell their cochlear implant technology to their direct competitor, a company called Nucleus.

6 Conclusions

We have analysed three exemplary phases in the innovation process around cochlear implants: 3M's approaching of other actors and creation of research, production and sales networks; the contested development of FDA guidelines and the appearance of novel groups of actors.

All these processes are predominantly "social" in the conventional sense, although they are inextricably linked to the process of innovation in cochlear implants. If we would substitute a case that considered a social innovation (e.g. a local currency system) for the cochlear implant story, we would not be able to find any formal or qualitative difference in the process, only content-related differences, i.e. the actors would naturally be different, but the mechanics of the innovation process would not. If an actor pursues a social innovation, it is crucial for her/him/it to define and approach actors, target groups, etc. There will also be guidelines, forms, documents, reports which appear as relevant actors (e.g. a document defining the local currencies relationship to the mainstream currency or an approval of the local currency from the national bank) and which are inscribed views of the world. New actors will appear along the way, for instance when one target group splits into those enrolling in the programme of action and in those who won't. Actors would try to black-box parts of the chain of associations, for instance by defining and communicating the rules of the game for the local currency. Once all actors in a given region know what this local currency is and know how to deal with it, a part of the process chain is black-boxed (negotiating with currency users and convincing people will not be that important and resource consuming any more). However, if a group of actors contests the local currency system, not accepting the bills anymore, then the black-box is opened, intermediaries turn into mediators and negotiations have to start again.

Interestingly enough, it is Latour with his emphasis on bringing the material realm to the fore who offers us a perspective on innovation that does not discriminate between technological and non-technological innovation (with the former usually considered more important). For sociological studies of innovation

[4] "Program manager states intention to extend reach with cochlear implants into the residual hearing population to expand market potential" (Van de Ven et al. 2008, 283).

(and STS research), this non-discrimination has an impact on a theoretical as well as an empirical level: Forms of innovation that are currently labelled differently in mainstream discourse have to be analysed using the same vocabulary. It is this aspect that we have focused upon most prominently in this text.

However, the theoretical insights also suggest to maintain a normative and programmatic notion of social innovation: When so called technological and non-technological innovation processes are not different in their nature, then they also have to follow the same normative standards and have to be evaluated correspondingly. Furthermore, this conceptualisation allows for the possibility of (societal and theoretical) learning and generating insights how to design innovation processes in a sustainable, inclusive form.

Based on this understanding, we propose to conceptualise social innovation as a new paradigm for innovation management, research and assessment rather than being considered a distinct form of innovation in itself. "Social" is not a criterion that would allow to differentiate social innovation from economic or technological innovation. All innovations are social processes of interaction and communication and we currently also see a development where business innovation in the mainstream economy becomes more participative in using focus groups, crowd sourcing, or open innovation models. Furthermore, all innovation outputs – from the washing machine to the mobile phone – potentially have social outcomes and impacts, for instance by changing the organisation of household work or by changing communication patterns, and sometimes they meet social needs quite directly. Of course, all this happens within the constrained economic logic of competitive advantage, means efficiency, market entry, consumer decisions and profits (the exact logic that led the 3M cochlear implant to failure). This logic, in not being "holistic" and in partly excluding other logics as for instance ecologic sustainability or social inclusion, currently causes un-intended (but well known) negative side-effects and generally externalises many "costs". The *gradual* difference between *conventional* economic/technological innovation and social innovation might thus be the extent to which different societal logics are combined and integrated in the design, management, research and assessment of innovations. This is where the "social innovation paradigm" comes in.[5]

We can refer to Latour in formulating some elements of the social innovation paradigm. He draws our attention to the hybrid actor-networks that we produce in innovation and to the fact that we cannot isolate these actor-networks from our "human society". We therefore need instruments that allow us to monitor innovation and diffusion processes much more extensively ("social impact assessment" would probably be such an instrument) to see how innovation changes our society. ANT shows us that the innovation process never really stops, innovation is never just a product; it rather establishes a new actor-network of humans and non-humans that lives on in the collective. It has to be maintained, monitored and re-assessed. Following ANT we may furthermore suggest that we need more "speakers"

[5] As a side note: Akrich et al. (2002a, b) themselves ventured into generating inputs from their theoretical edifice to professional (commercial, market-oriented) innovation management.

(cf. Akrich et al. 2002b) and a better articulation of different logics and action programmes in the management of innovation but also in the assessment of innovation outcomes on multiple dimensions: social, cultural, individual, ecologic, political and economic. Practically, this means that we will have to explore new modes of how stakeholders can articulate themselves and can actively participate in innovation processes. Since we cannot determine once and for all what "the good society" is, we will rely on meta-values such as pluralism, participation, consensus building and responsiveness to perceived social problems (cf. Etzioni 1968 to name but one possible reference). These meta-values should be used to assess the aims and outcomes of innovation as well as to guide the innovation process. The aims of innovation will have to take diverse advantages and disadvantages articulated from different stakeholders in society into account. Social innovation will also have different criteria for the "efficiency" of innovation processes – where the additional time needed for discussion, negotiation and decision making will be counterbalanced by direct positive side-effects of the process itself and more sustainable and accepted results.

The social innovation paradigm would thus encompass all forms of innovation without being restricted to "purely social" activities which only include direct human-to-human interaction being isolated from technological and economic innovation per se. This new paradigm is already at work changing the innovation landscape, it becomes visible as civil-society driven innovation, as social entrepreneurship driven innovation, or as innovation driven by cross-sector cooperation. And it already has many instruments at hand that transform innovation processes and outcomes – from participation models to new forms of impact assessment. And maybe most importantly – a broader understanding of social innovation can help us to identify, support and assess the gradual transformation from conventional innovation processes to social innovation processes that will hopefully be more responsive to social needs and problems, will be more accepted, will have less negative side-effects and will make society as a whole more flexible in dealing with societal challenges.

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