

**Deepening and broadening the critique of
technology: An analysis of an ANT approach**

Thesis by

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Submitted in fulfilment of the requirements of the degree

Philosophiae Doctor (Information Technology)

in the

School of Information Technology

of the

**Faculty of Engineering, Built Environment and Information
Technology**

University of Pretoria

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April 2009

Abstract

This study contributes to critical studies of information systems (CRIS) by addressing two limitations: the generally weak theorisation of technology and the limited focus of critique. Technology is weakly theorised because it is mainly seen in instrumentalist and constructivist ways. It is argued that these understandings of the technological limit the focus of critique to human plans, intentions and relations. The study joins the quest for specificity about technology and while it does not only focus on what is inscribed into it, the study also looks at the effects of the technological actant. The ANT conception of technology as an actant in heterogeneous networks opens various new avenues for critique. It is argued that the processes of technologising play a central role in socio-technical networks and that they have certain effects which contribute to both change and stability. The technological could not be limited to the “purely” technical, but has effects on the typical human functions such as communication, cognition, morality and ends. Although it is acknowledged that the social and the technical are closely intertwined, critique could still focus on the role of the technical. The particular effects of technology in the heterogeneous networks are of central concern to the critical researcher who wants to contribute towards the morality of the processes through which heterogeneous networks are built. The study investigates in some depth the conceptions of technology and of critique in information studies. This is contrasted with similar investigations from an ANT perspective. Case studies were used and reinterpreted to show how such a critique of the socio-technical networks might be done. Conclusions are drawn about the nature and functioning of technology and of critique; of the role of actants in networks and of the role of the critical researcher and of critical theories. The study contributes towards a deepening and broadening of critique. The deepening of critique refers to the need for a critical function within the very processes of assembling and not as something that could only happen afterwards. The broadening of critique refers to the participation of all entities (human and nonhuman) in the processes of critique.

Declaration of originality

I declare that this thesis, *Deepening and broadening the critique of technology: An analysis of an ANT approach*, is my own work, that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references, and that it has not been submitted for a degree at another university.

Acknowledgements

- Professor Roode for his patience, positive support and meticulous comments
- Mariëtte for the careful editing
- My family for their assistance and endurance
- The Faculty of Education, University of Johannesburg, for enabling working conditions

Abbreviations

| | |
|------|---|
| CMS | Critical Management Studies |
| IS | Information Systems |
| IT | Information Technology |
| ISR | Information Systems Research |
| ANT | Actor-network theory |
| ISD | Information System Development |
| ICT | Information and Communication Technology |
| CT | Critical Theory (Frankfurt School and Habermas) |
| EISD | Emancipatory Information Systems Design |
| CRIS | Critical Information Systems Research |
| SSK | Sociology of Scientific Knowledge |
| STSS | Strong Thesis in the Sociology of Science |
| STS | Science and Technology Studies |

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Introduction

Projects drift; that's why they're called research projects. (Latour, 1996a:91)

Technology in general and information and communication technology in particular have assumed a prominent role in shaping the world. This happens to such an extent that the current period obtains its characterisation from technology by being described as the “information society” or the “network society” (Castells, 1996) where the primary means of production is seen to be the “mode of information” (Poster, 1990). The way the world is increasingly being shaped by technologies which are taken for granted as an invisible part of everyday life, is indicated by the following general statement about technology:

Our technologies surround us, as they have for millenia, but never before have they been so powerful. Never before have they brought so many benefits. Never before have they had such potential for destruction – in many cases a potential that has been realized. And never before has the task of understanding those technologies – how they are shaped, how they shape us – been so urgent. (Law & Callon, 1994:306)

It is also indicated by the following more specific statement about information technology and information systems:

The information sciences have this century grappled with new ways of configuring, storing and retrieving information, as fundamentally novel as was the printing press in its day.... This new infrastructure has powerful ramifications, comparable to the railroads or electricity ... infrastructures that respectively accompanied the first industrial revolution and drove the second. Because new information infrastructures fundamentally change both work practice and knowledge, they also inscribe a moral order. They do so by allocating resources structuring markets ... and affecting the rhythm of daily life. (Bowker, Timmermans & Star, 1996:345,6)

Technology could be seen as ambiguous in the way it contributes simultaneously to development and towards forms of exclusion, domination and oppression. The ambiguity of technology lies in the way the beneficial role cannot be clearly distinguished or separated from the maleficent role. It seems to be the case that, while technology contributes to development, it inevitably and simultaneously contributes towards forms of exclusion. The developmental and enabling role of technology lies in the way it makes new ways of living and new worlds possible, the way it liberates humans from the toil of labour, connects people, and shapes human identity as captured in the notion of the “co-evolution” of the human and the technical (Castells, 1996). Critical questions could be asked about the priorities and distributions of the benefits of technology, or the ways in which people are excluded by technology. It seems that the involvement of technology contributes to new forms of exclusion and domination and towards new threats to a democratic project.

The role of technology towards forms of domination and exclusion is more intensive as humans and technologies become increasingly entangled. The domination is described in different terms such as more efficient bureaucratisation (Weber, 1947), the invasion of the lifeworld (Habermas, 1984), as enhancing capitalist exploitation or as strengthening new forms of colonialism. Domination through technology occurs in different ways. In a direct way domination takes place through control and surveillance as presented by the notion of the panopticon (Foucault, 1975). A combination of technology described as a leverage of power (Latour, 1994:229) and the way it enables the concentration of power, provides for the effective exertion of power from a centre of control. Improved technologies which overcome the limitations of time and space open the third world to more effective exploitation by the first world. Surveillance technologies diminish the protective shell of private space. Through the mediation of technology, control over a distance (Law, 1986) becomes possible.

In a more indirect way domination takes place through exclusion and categorisation (Bowker & Star, 1999). This is indicated by the phenomenon of the “digital divide” (Castells, 1999), which refers to the uneven presence of technology in the first and third worlds, or to the gender class divides. This lack of access to technology deprives some groups and localities from participation in the informational mode of

production. Exclusion does not only refer to the fact that various kinds of technologies are not available in many areas of the world, but to the unsuitability of the mere transfer of technology from one context to the other (Moodley, 2005). The origin of this divide lies in the way western society bases its perception of superiority on its characteristic as a technological society (Bloomfield & Vurdubakis, 1994:12). Under the pretence of mere technological transfer, western countries also transfer the social meanings embedded in technology with the result that the transfer of technology is also a form of “control over a distance” (Law, 1986).

The potential for domination seems to be an inherent feature of technology when it is described as ideology (Pippin, 1995). Bowker & Star (1994:187) state that

Modern information technologies embed and inscribe work in ways that are important for policy-makers, but which are often difficult to see . . . arguments, decisions and uncertainties . . . are hidden away inside a piece of technology or in a complex representation. Thus values, opinions and rhetoric are frozen into codes, electronic thresholds and computer applications. Extending Marx, then, we can say that in many ways, software is frozen organizational discourse.

Once technology has become “black boxed” (Callon & Latour, 1981:285), the internal processes where meaning is created disappear from public scrutiny and the only visible elements are the inputs and outputs. The majority of users of technology are therefore unaware of the ways in which they (users) contribute to the reproduction of the often oppressive social structures (Giddens, 1976) through their own actions and the way in which they are already implicated in oppressive technologies.

The ambiguous nature of technology is the focus of many critical approaches which draw from various traditions. A radical condemnation of technology is present in the onto-critique of Heidegger (1977) and in various kinds of cultural critique such as Ellul (1964) and Postman (1993). More qualified forms of critique are present in the Marxist tradition (Chapter 2, Section 4) where the main issue is the question whether technology is under the control of capitalism or of the workers. In the neomarxist tradition as represented by Habermas (Chapter 2, Subsection 6.2), technology is seen as inherently potentially dangerous and should therefore be contained.

It is therefore clear that the way in which technology is implicated in forms of domination and the ambiguous way in which technology contributes to development necessitate a critical scrutiny of technology. Technology cannot merely be seen as a

benign entity which brings progress, because it is involved in the politics of society (Winner 1986:8). This study aims to address this problem by contributing to the research tradition that reflects critically on technology.

The field within which this study is located, and within which the role of information technology is critically investigated, is Information Systems Research (ISR). The critical research in this field has slowly gained momentum over the past 30 years and is categorised under the name of Critical Research in Information Systems (CRIS) (Stahl, 2008). Although the allocation of a single name hides the fact that the field of critical research is still underdeveloped and fragmented, it contributes towards a common debate about fundamental issues in research.

Although a variety of critical approaches towards technology has been developed and a significant body of literature has been generated, indications are that the terrain has not yet been adequately explored, and that much needs to be done to explore the basic issues. Lyytinen (1992:171) discusses the general poverty of critical approaches, while Mingers (1992) discusses the failure of critical approaches to theorise the role of power in organisations. Ten years later, Brooke (2002b) comments that the existing critical approaches are limited and one-sided. She goes on to identify two limitations in CRIS namely the lack of a social theory, specifically on the nature of emancipation, and an inadequate conceptualization of power. Besides this, an agreement does not exist about the meaning of the concept “critical” in critical research. She attempts to centre the concept as follows:

The emancipatory interest rather than the detailed following of any one particular theorist may be a suitable binding force that holds these diverse approaches together. Nevertheless, as the espoused practice of critical inquiry broadens, so the values and assumptions that underpin its theoretical execution needs to be more explicitly articulated, and reflexively critiqued within each research context. (Brooke, 2002b:56)

Besides the fact that such basic concepts are not yet adequately clear, adequate clarity has not yet been obtained about theoretical perspectives that might inform the terrain. Brooke (2002b) finds it a limitation that most of the critical research draws on the theories of Habermas and recommends that other theoretical approaches to critique should be explored such as that of Foucault. Various other theoretical perspectives that have been drawn upon will be discussed in Chapter 2. This study

aims to contribute to the search for relevant theoretical perspectives which might illuminate the nature and task of critical research in IS. It should also contribute towards the clarification of key concepts and methods of critique.

The critique of technology that needs to be developed has to address two closely related issues: it has to understand the relation between the social and the technical, and it has to be specific about technology. These two issues appear regularly in comments on the state of the field. Authors such as Orlikowski & Iacona (2001), Hanseth (2005) and Hanseth *et al.* (2004:117) report on the need in ISR to conceptualise the “technological artefact” and the relation between the technical and the social. They find this lacking even in structuration theory which represents important insights in the relation between agent and structure. This conclusion is also confirmed by Sawyer & Crowston (2004:36) who have identified two areas that the IFIP community should focus on in the next 25 years: a better conceptualisation of ICT and detailed socio-technical theories. It will be indicated in Chapter 2 that both these issues have also not been adequately addressed in CRIS and that this failure leaves a gap in the critical views of technology.

In relation to the second issue, Monteiro & Hanseth (1996) demand that we should be specific about technology, and Rose *et al.* (2005:147) pose a challenge to researchers “to be specific about what the technology *does*”.

In relation to the first issue, the social and technical are mainly understood as clearly separate and opposing terrains as testified to in this view of Woolgar, 2002:263):

We can learn from the many efforts to break down another entrenched duality: that between the social and the technical. Debates around this duality have been highly charged: they ‘bring out the religious in people’. This is because, as science and technology studies have convincingly shown, technology can be understood as politics by other means. In particular, technology can be understood to comprise sets of congealed social arrangements. That is, it embodies possibilities for action and relationships.

The lack in most critical approaches to theorise technology leads to an inability to recognise the possible roles played by technologies in the constitution and maintenance of societies. This lack prevents an adequate analysis of the ways in which the human and the technical interrelate. It also leads to a limited form of critique. Mitev (2006:320) shows how the failure in CRIS to adequately conceptualise

the relation between the human and the technical could lead to the entrenchment of managerialism. Since technology is mainly developed with managerial interests in mind and since the technical is often seen as operating according to inherent principles which should not be interfered with from outside, the managerial interests remain hidden. While these interests remain hidden behind an apparent autonomous technology, wider involvement in and scrutiny of the development of technology are discouraged. The lack of a proper conceptualisation of technology limits the depth and scope of its critical evaluation. It is only when the technological artefact is adequately theorised and its role in the socio-technical whole is recognised, that it would be possible to unravel the many ways in which the human and the technical interact and to identify in which ways this might be problematic.

An understanding of the close relation between the social and the technical is often expressed in ISR. Lee (2001:iii) defines the field of ISR as follows:

[R]esearch in the information systems field examines more than just the technological system, or just the social system, or even the two side by side; in addition, it investigates the phenomena when the two interact.

In support of this, Avgerou, Ciborra & Land (2004:5) state that the

critical social theoretical orientation has not been lost, but the social study of information and communication technology (ICT) abandoned simplifying dichotomies such as 'empowerment versus managerial control' and 'liberation or domination' by ICT ... with critical social studies addressing more subtle issues regarding a person's experience with ICT in the modern social context.

Because of an unclear understanding of the nature of and relation between the social and the technical, critique is often rendered from both objectivistic and subjectivistic points of view. Objectivistic views, as presented by Heidegger (1977), see technology as a substantive power which shapes the social world on its own. Technology operates and develops according to an internal logic which could, according to Bloomfield & Vurdubakis (1994:9) be related to most of the research interests and fields such as "Human-Computer Interaction", or the "Social Impact of Computers". These forms of critique fail to recognise how technology is also shaped by subjective factors associated with society.

On the other hand, subjectivistic forms of critique, as present in technological constructivism, sees technology as nothing more than the product of human ideas and interests. Technological constructivism has shown how the technical reflects social ideas and interests and the critique of the social is simultaneously also critique of the technical. In this way, Feenberg (1999) describes the “technical code” as the social meanings embedded in technology, and Pinch & Bijker (1987) describe how the shifting social meanings lead to the development of the current bicycle which reflected the social interests of the time. Technology is seen here as part of a programme through which social meanings are inscribed in technical objects. Although constructivism provides very important mechanisms of critique, there is a limitation inherent in the view that technology is nothing more than a projection of the social. The question is not asked how the social itself comes to be the way it is and how technology contributes to the construction of the social.

These two forms of critique (which will be described more fully in Chapter 2) fail to recognise the mutual relation between the subjective and objective worlds, or between the social and the technical. The problem with the social critique of technology is that it does not recognise how the social (being, culture or lifeworld) is already shaped by technology. The problem with the critique, where technology is seen as an entity on its own, is the failure to recognise how technology is already shaped by the social. A critique which focuses on technology as a substantive entity attributes negative effects to the presence of technology as such and tends to look for a solution in the replacement of one technology by another. It fails to see how technology is part of a more complex social network. Critique that emphasises the social construction of technology looks at the motives and interests of the designers without realising the complex social and technological networks that need to be in place in order for those interests to be realised. It also fails to see how the perceived initial interests may be changed in the process. These approaches are therefore not adequately aware of their own bias of critique and lack the requirement of critical self-awareness and a critical account of own assumptions. A move is therefore

needed beyond objectivism and subjectivism¹ in order to further develop a critical approach to technology.

A more comprehensive approach to the critique of technology should be based on the recognition of the close relation between the human and the technical as expressed in notions such as “cyborg” (Haraway, 1991), the “co-evolution” of the human and the technical, or the “hybrid collectif” (Callon & Law, 1995). The recognition of such a close relation manifests also in ISR (Ramage, 2004) where attempts are made to overcome the different kinds of dualism in the subjectivistic and objectivistic views. This kind of research that moves beyond objectivism and subjectivism is necessary in the study of modern ICTs because of the complex entanglement of the human and the technological. Humans are increasingly surrounded by technologies which do not only share with them the mechanical work of industrial technologies, but increasingly the mental work of information technologies. The mental world that is regarded as uniquely and typically human is increasingly being encroached upon by technologies. It is therefore a matter of urgency that a more sophisticated set of conceptual tools is developed to describe and analyse this state of affairs.

While this study interacts closely with the emerging field of CRIS, it wishes to address the two issues by means of an investigation of how they appear in actor-network theory (ANT). In opposition to dualistic views of the social and the technology, the strength of ANT lies in the way the two elements are brought together as testified to by Hanseth *et al.* (2004:117):

And the good news is, then, that it is exactly this borderline between the social and the technical that ANT has been developed to help us analyze and understand.

Hanseth *et al.* (*ibid.*) contrasts the way ANT relates the social and the technical with other approaches such as those based on Giddens’ structuration theory. They find that these theories “do not address the role of technology in a proper way”. Besides recognising the role of technology in the social, ANT also questions the way the

¹ This is similar to the move Bernstein (1983) makes to find a solution to the dichotomy between subjectivistic and objectivistic epistemologies.

social and the technical are usually defined in clearly separated ways. The arbitrariness of the distinction between the human and the technical is indicated by Bloomfield & Vurdubakis (1994). They show that the way boundaries between the social and the technical are drawn reflects power relations in an organisation and do not rely on inherent differences between the two kinds of entities. The belief, for example, that ICTs should be exploited to enable flexibility for people may only have the effect of placing people within a different managerialist context. According to Walsham (1997) ANT makes an important contribution to the understanding of the relation between the social and the technical. By drawing the technical into the socio-technical whole, ANT shows that human and technical exclusion and exploitation interrelate and that humanity cannot be “saved” without simultaneously “saving” technology. ANT also shifts critical questioning from uncovering of false consciousness to identification of the excluded.

This study does not want to go the route some have followed to combine ANT with other critical approaches. Such attempts are, for example, present in Mitev (2003) who combines social constructivism and ANT, Monteiro (2000) who allocates to ANT the empirical studies, Doolin & Lowe (2002), Klecuń, (2004:267) who wants to combine critical theory based on Foucault which provides the theoretical perspectives, and ANT which provides the empirical analysis. The aim of this study is rather to provide an in-depth analysis of ANT and to show what critique might look like from an ANT perspective only. The problem with many of the eclectic combined approaches is that neither of the theoretical perspectives brought together in such a marriage are understood on their own terms and that important differences between them are glossed over.

This attempt to focus on a possible contribution of ANT towards a critical conception of technology, may come as a surprise for two reasons, one being the association of ANT with ethnography, and the connotation between ANT and managerialism. ANT is mainly known for its careful descriptive ethnographic studies of assemblies such as socio-technical systems. These ethnographic research approaches stand in the tradition of interpretive approaches that are usually seen as non-critical. Habermas (1978:310) has indicated, for example, that interpretive approaches are not capable of asking critical questions because of their (limited) focus on the mere

understanding of social phenomena. The suspicion that ANT is not conducive to critical research is confirmed by the many instances where it is employed in the service of managerialism in organisational studies (Monteiro, 2004:132). Here the processes defined in ANT, such as enrolment or translation, are used in strategic ways to create more coherent organisations. The ANT concepts of actant, enrolment, translation, irreversibility (see Walsham, 1999) are used to show how networks could be constructed and maintained through the alignment of interests. Scepticism about the critical potential of ANT has also been expressed by Walsham (1997) who questions the critical possibilities in an approach where a clear distinction is not made between the human and the technical and where the possibility does not exist of a perspective outside the network from where critique could be launched. Saldanha (2003) summarises the views that indicate the lack of a critical perspective in ANT which is seen as managerialist, centrist, relativist, not geographical enough, too anti-humanist and too local.

Although a critical approach is not prominent in the analyses of technology by ANT (Bijker, 1993), proponents of ANT have started to indicate the implication for a critical approach to technology in organisational studies (Doolin & Lowe, 2002; Marres, 2004; Bloomfield & Vurdubakis, 1994; Klecuń, 2004). Although it is true that many ANT studies focus on assembling a network from the perspective of a dominant agent, some of these studies show that these networks could also disintegrate because of the failure to enrol all the entities successfully (Latour, 1996a; Callon, 1986b). In his reflection on the unifying managerial uses of ANT, Law (1999) points to the way in which ANT promotes an appreciation of heterogeneity and complexity. Latour (1999a:16) reacts to the managerial misuses of ANT by wanting to recall it because of the “managerial, engineering, Machiavellian, demiurgic character of ANT”. His further elaboration of ANT indicates, however, how such distortions could be overcome. The article by Star (1991) represents an important turning point in the self-consciousness of ANT that does not always take the excluded seriously. The important point is, however, that the same kind of analysis in these studies could be used as a means of critique.

The attempt by Castree to elaborate on the critical value of ANT in geography is an indication of the potential of critique.

I focus on ANT for several good reasons. First, as noted, it is one of the newest and most influential paradigms of nature-society relations to be embraced by left-leaning geographers. Though its nominal founders—notably Bruno Latour, Michel Callon and John Law—deny that it is a theory in the conventional (ie, “meta” or explanatory systematic) sense, ANT concepts are nonetheless being promoted in left geography as wholesale alternatives to existing critical theorisations of nature. (Castree, 2004:115)

In order for ANT to contribute towards the critique of technology, the meaning of critique should be shifted. It will be shown in Chapter 4 how ANT develops an understanding of critique that differs from traditional views. The relevance of ANT for an understanding of technology lies in the way the technical and the human is understood. ANT also provides conceptual tools to understand the functioning of technology in the socio-technical context. In addition to this, the relevance of ANT for the critique of technology lies in its central concern about the way power is collected and distributed in the socio-technical networks and in the ways in which boundaries are drawn.

The intention to critique is clearly present in ANT which wants to make a critical difference (Law, 1999:11; Latour, 1999b; Latour, 2004a) without falling into the trap of a “singularity”, a centre from where all differences could be judged.

But, or so I firmly believe, the real change to make difference lies elsewhere. It lies in the irreducible. In the oxymoronic. In the topologically discontinuous. In that which is heterogeneous. It lies in the modest willingness to live, to know, and to practice in the complexities of tension. (Law, 1999:12)

In his reflection on the relevance of ANT for critique, Latour (2004c:225) asked “What has become of the critical spirit? Has it run out of steam?” He does not question here the legitimacy of critique, but expresses concern that the modern form of critique does not aim at the right target or in the right way. ANT will be portrayed in this study as contributing in important ways to the self-understanding and practices of critique.

It seems from this brief insight that opportunities exist within the context of ANT to elaborate on the critique of technology, and that this potential has so far not been systematically investigated. A number of ANT studies have been done, but the critical implications are not explicitly drawn out. Although Walsham & Sahay (1999), for example, draw on ANT in their analysis of geographical information systems in

India, they do not utilise the critical potential of ANT to question the potential disruption of Indian culture by western technologies. The value of ANT could be found in the various concepts and procedures used to analyse the establishment and maintenance of socio-technical contexts that allow a different understanding of the role of technology, power and agency. An important insight of ANT is the realisation that socio-technical systems that appear to be static and impenetrable, actually need constant maintenance.

This study wants to address this gap in critical research of technology by exploring more fully and systematically the potential for a critical approach to technology based on ANT. Since theory does not only enable us to understand practices better and to see things differently, but also to see new things, this study wants to theorise about technology and critique.

In order to gain a better understanding of the way these elements contribute towards a sustained approach to the critique of technology, the following route will be taken in this study.

- a) Chapter 2 provides an account of critical research in ISR. It discusses critically how a Critical Theory conception of critique dominates the terrain, but also how other approaches to critique have emerged. It analyses the ontological and epistemological assumptions of these critical approaches. The main conclusion that transpires from this chapter is the increasing diversification of critique. While this is seen by some as a problem, it necessitates a different take on the nature and procedures of critique.
- b) While Chapter 2 investigates the conceptions of critique in ISR, Chapter 3 tackles conceptions of technology in CRIS. It shows that technology is not clearly conceptualised and the relation between the social and the technical untheorised. When related to the discussion in Chapter 2, it becomes clear that the critique of technology remains limited without these conceptions and theories. Together these two chapters provide the background against which ANT's conception of technology and of critique will be developed.
- c) Chapter 4 provides a general overview of ANT which is necessitated by the many misconceptions about ANT or the very selective employment of ANT fragments in

the literature. It is found that an adequate account of technology or of critique cannot be given if a deeper understanding of the basic principles and strategies of ANT is not provided. This chapter then forms the essential background for the detailed investigation of critique and technology in the following three chapters.

- d) Chapter 5 consists of an in-depth analysis of the way ANT understands technology. It will be indicated how ANT takes technology seriously and what the relations are between the technological and the human. This account is contrasted with the discussion of technology in Chapter 2.
- e) A description of an ANT perspective on critique is done in Chapter 6. It is argued that critique is not so much an identification of distortions and of forms of domination, but deals mainly with the shifting of identities and the maintenance of a particular configuration of power in the form of exclusions and hierarchies.
- f) The insights from the previous two chapters are brought together in Chapter 7 to explore what a critical approach to technology, based on ANT, might entail. It follows the example of Walsham (2001) by discussing and reconstructing various case studies of socio-technical hybrids in order to illustrate which critical perspectives could be generated from an ANT approach.

Finally, it has to be noted that the study does not attempt to apply ANT, but it should be seen as a translation of ANT that does not attempt to replicate what has been said in its name, but to think along the ANT way.

Critical Approaches to Information Systems Research and Development

1. Introduction

In order to gain perspective on the approach of ANT to the critique of technology, a broader investigation is needed of conceptions of critique and of technology in Information Systems Research (ISR). This chapter provides a critical account of the way critique is understood in ISR, and the following chapter evaluates the conceptions of technology in ISR. Together, these two chapters identify some of the limitations of critical conceptions of technology in ISR and pave the way for the conceptions of critique and of technology later on.

Critique in ISR depends to a large extent on critical research in related fields such as Organisational and Management Studies. This relation provides critical research in IS with important paradigms of critique, but also comprises a crucial limitation. What is significant of most critical approaches in ISR is that technology itself is seldom the focus of analysis and that critique is mainly related to human and contextual factors. The research fails to recognise the multiple ways in which the distinction between humans and technology has become increasingly blurred. Because of this social bias of most critical traditions, the materiality of technology is not taken seriously.

The chapter shows that critique in ISR is understood in many different ways depending on the tradition within which one works. The critical traditions consist of a wide variety of approaches including traditional Marxism, critical interpretivism, critical theory and, what is called a movement beyond critical theory which draws on poststructuralist and postmodern thinkers such as Foucault and Bourdieu. It has to be acknowledged that critical theory still occupies the main position against which other approaches define themselves. The chapter is organised on the basis of the main paradigmatic trends in the critical approaches, viz., Marxism/structuralism, critical theory, critical interpretivism and post-critical theory. Under post-critical theory a range of approaches are placed which react in some way to aspects of critical theory without having developed any clear alternative yet.

In this process various themes and issues are analysed which will later reappear in the analysis of ANT. Since definitions of critique are dependent on paradigmatic frameworks, the various approaches to critique contain different ontological and epistemological assumptions. The analysis will also look comparatively at the research methods, the role of the researcher and the purposes and targets of critique. The aim is to identify the assumptions and practices of critique in these traditions in order to contrast the assumptions and practices associated with an ANT approach.

The chapter first presents a general analysis of the basic components of critique which is followed by an overview of the field of critical ISR.

2. Analysing critique

In order to capture different nuances of critique, an inclusive definition of critique is used. Theories about the following elements could be discerned in critical approaches:

- intention, aims and targets (foci)
- methods, processes and strategies of critique and transformation
- agents of critique and of transformation
- the validity of critical statements and of the transformed state

This could be compared to the five themes which, for Howcroft & Trauth (2004:197), are present in most critical approaches: (1) emancipation from restricting power relations (target); (2) critique of tradition (target) which aims to disrupt the status quo and existing patterns of power (aim and strategy of transformation); (3) non-performative intent (purpose) in reaction to managerialist efficiency and productivity (target); (4) a critique of technological determinism (target) where technology is unproblematically taken as the transformer of society; and (5) reflexivity which recognises the shaping of knowledge by interests and power (strategy of critique).

The analysis could also be compared to Alvesson & Deetz' (2000) well-known definition of critique as containing the elements of insight, critique and transformation. "Insight" relates to the target because it contains an analysis of the situation that must be changed. "Critique" in this definition refers to the processes of critique and "transformation" refers to the identification of a transformed state and to the processes of transformation. It could also be compared with the four characteristics of CRIS identified by Stahl (2008): critical intention, critical topics, critical theories and critical methodologies.

2.1. *Intention, aims and targets*

"Intention" refers to the subjective motives of the researcher, "aims" at what the researcher wants to achieve and "targets" to what the researcher wants to change. Various elements of critique come to the fore in the following excerpt from Klein & Myers (1999:69) which provides a typical account of critical research:

IS research can be classified as critical if the main task is seen as being one of social critique, whereby the restrictive and alienating conditions of the status quo are brought to light. Critical research seeks to be emancipatory in that it aims to help eliminate the causes of unwarranted alienation and domination and thereby enhances the opportunities for realizing human potential.... To make this possible, critical theorists assume that people can consciously act to change their social and economic conditions. They do, however, recognize that human ability to improve their conditions is constrained by various forms of social, cultural, and political domination as well as natural laws and resource limitations.

The critical intention of the researcher, presented as "social critique" above, is seen to be the most important element of critique. O'Donnel & Henriksen (2002:98) describe it as an obligation:

Critical theorists have a post-metaphysical moral obligation to identify practices of social oppression and exploitation due to ICT in daily social life and recommend strategies through which they might be changed.

The intention, aim and target are stated by Stahl (2008:139) as follows:

I propose the definition of critical research as research characterized by an intention to change the status quo, overcome injustice and alienation, and promote emancipation.

These elements are defined by Klein & Myers (1999:69) as follows:

IS research can be classified as critical if the main task is seen as being one of social critique, whereby the restrictive and alienating conditions of the status quo are brought to light. Critical research seeks to be emancipatory in that it aims to help eliminate the causes of unwarranted alienation and domination and thereby enhance the opportunities for realizing human potential.

The researcher is not a mere recorder of information (positivist) or an interpreter of meanings (interpretivist), but selects and gathers information about certain issues to bring about change to a situation diagnosed as deficient in some way. Although change may also be a motive in positivist research, critical research is informed by ethical concerns (Stahl, 2008) of justice and emancipation. Critique aims therefore to transform the situation through some kind of intervention.

Whereas the intention refers to the desire to bring about a certain kind of change, we need some clarity exactly what it is that should be changed. In general the target of critique is any situation of injustice. This is often associated with the “status quo” (Orlikowski & Baroudi, 1991:19), described as inadequate, contradictory, oppressive, limiting human freedom, productivity and creativity. It is also characterised by the operation of technical or instrumental rationality, managerialism (Cecez-Kecmanovic, 2005:26), authoritarianism, undemocratic practices, forms of domination and exclusion, gender bias, lack of workers’ rights and unsatisfactory working conditions. A particular section of society or humanity, such as workers, or women, or the third world, is disadvantaged through one or more of these processes.

As far as technology in particular goes, the focus of critique is technological determinism (Howcroft & Trauth, 2004:207) or deterministic technologies (Cecez-Kecmanovic, 2005:26). Information technology is often regarded as a means to enhance managerial interest in control and as a means of technical rationality.

Behind these definitions of the targets of critique are views of human nature which includes an understanding of freedom. The targets of critique are defined because they inhibit human potential and freedom, they are alienating, promote inequality and asymmetry and lead to marginalisation, exclusion, oppression and domination. The aim of critical research is therefore to achieve transformation of these practices (Alvesson & Deetz, 2000). In the above quote of Klein & Myers, the change should contribute to “realizing human potential” and the removal of “the causes of unwarranted alienation and domination”. Other aims are stated such as emancipation, self-realisation, creativity and self-management.

The intention, aims and targets are defined by Avgerou (2005:106-108) as follows:

More recently, different types of concerns have emerged in the critical research agenda of the social sciences. Indicative examples include: the isolation of the individual in the weakening fabric of Western societies ...; the beyond scientific control techno-scientific interventions on the planet and the risks entailed by contemporary social institutions, such as the global financial system ...; and the new forms of marginalization relating to technology-mediated knowledge manifested in the ‘digital divide’ discourse either at a local or global scale

To that end, it has to form streams of sustained research and debate on ICT and social change. If suspicious of ‘managerialism’, as McGrath suggests, it has to form a clear non-managerialist research agenda that will contribute an alternative view of the role that ICT plays in contemporary institutions.

With specific reference to IS, Cecez-Kezmanovic *et al.* (2008) describe the aims and target:

Critical IS studies aim at revealing, criticizing and explaining how the development and use of IS in organizations and society in the pursuit of efficiency, rationalization and progress also increase social control and domination, with potential detrimental consequences for some stakeholders and society as a whole.

For Walsham (2005:113) global inequity in relation to access to resources and opportunities is a major problem. He (2005:114) also refers to the power relations between different groups, the hierarchical organization of work, or approaches to surveillance and control. For Hirschheim & Klein (1994:109), the critical approaches focus on "barriers to emancipation - in particular ideology (distorted communication), power and psychological compulsions, and social constraints - and seeks ways to

overcome them". One of the central topics of critical research is power and empowerment (Stahl, 2008:140).

Critique and transformation is possible because the status quo is seen as not necessary and as the outcome of contingent historical and social processes. Contingency implies that it could have been different and critique implies that it should be different. Various critical approaches to technology emphasise the way in which it could have been designed differently.

2.2. *Methods, processes and strategies of critique and transformation*

How does critique establish what is wrong with a situation? How does critique know something is "alienating" and "oppressive"? Are there methods of critique which meet the same rigorous requirements as the methods of positivistic research? What processes of transformation should be followed?

In the quotation by Klein & Myers above, the strategy of critique is based on the assumption that "people can consciously act to change their social and economic conditions". Critique is therefore not just dependent on what the researcher does, but on his/her ability to inform and enlighten the people affected. This is needed because the "human ability to improve their conditions is constrained..." People fail to see how they are limited by their circumstances and are in need of the critical researcher. Transformation is not simply brought about by the critical researcher, but by the people involved. Howcroft & Trauth (2004:205) distinguish between a militant and a more dialogical option regarding the role of the researcher in critique and transformation.

The question is asked whether there are any specifically critical methods or whether it is more a matter of attitude and orientation. This question relates to the requirement for rigorous research in critical paradigms. In relation to interpretive research Klein & Myers (1999) ask the question whether criteria could be developed in the same way as research criteria in positivistic research. They do not develop a set of strict methods of research, but identifies criteria. Critical approaches are careful not to follow the positivistic notion of a unified methodology since they realise that truth cannot be revealed through method. We therefore find in critical approaches a variety of research methods and processes. There exists an

underlying belief in rationality where reason could identify and expose the idols of the mind (Bacon, 1915). Different critical approaches describe the methods of critique in terms of the posing of critical theorems, the reflexive uncovering of assumptions, ideologies and false consciousness, or the multiplication of narrative accounts.

Part of the question about the process of critique is whether a basis or orientation point of critique could be established. Is there a position from where critique of other positions and practices could be rendered? Is it possible for critique to come from inside a particular context, or does it necessarily originate from a source outside the position that is being criticised? Such a basis or orientation point of critique could be a rational or normative transcendental principle or idea, or it might be located in the interests of a particular group or class. If a legitimate position from where critique is rendered could be identified, it would also validate the critique. Such a class-based critique is typical of the Marxist preference for the working class, or a feminist preference for a privileged gendered place. Stahl (2008) attempts to find in ethical theories such a stance from where injustices in IS could be identified and critiqued.

The postmodern realisation that a basis of critique cannot be found leads McGrath (2005) to an acceptance of eclectic approaches and to the acceptance of a reflexive element in critique. She argues in favour of a closer connection between “research conduct” as a response to “the unfolding pattern of research findings” (McGrath, 2005:92).

A common element in many critical approaches is the operation of critical social theories. Such theories make it possible for the researcher to establish the root causes of the problem that must be identified and changed. These theories may comprise an account of an idealised society, a diagnosis of the ills of society (or any other social context such as an organisation or an information system), an identification of the symptoms of these ills, or the underlying causes.

Hirschheim & Klein (1994) present a process of critical reformulation in their critique of information system development. This consists of uncovering and critique of assumptions behind any particular methodology of information system design. The uncovering consists of the articulation of underlying beliefs which are then subjected to the informed opinion of current practitioners. The most penetrating reformulation is when neohumanist principles are used because they allow questions to be asked

about social effects of systems, relations of power, or the instrumental treatment of people.

A further methodological issue is the relation between the theories which inform and guide research and empirical investigations of the particular situation. While critical research has traditionally been strong on theory and weak on empirical investigation, voices are increasingly heard in favour of empirical research with a critical intent.

2.3. *Agent of critique and transformation*

Issues related to the agent of critique and transformation are inherent in the previous discussions. Who is ultimately responsible for critique and transformation? If it is the researcher, what provides the means and the power to the researcher to be placed in a position from where critique could be rendered? If the people under investigation are to be the agents of transformation, how are they enlightened, motivated and activated to fulfil such a role? The presumed neutral role allocated to the researcher in positivism and interpretivism, is exchanged for an active and activist role in critical research. This presumed neutrality of the positivist researcher is questioned in critical research which finds that his/her values of efficiency and productiveness often promote managerialism.

In critical theory the researcher plays a very important role. The researcher, equipped with a social theory and a moral commitment, identifies the wrongs and provide people in the situation with an analysis of the causes and symptoms of their oppression. In this process the researcher hopes to activate people as agents of transformation. This view is present in Orlikowski & Baroudi's (1991:21) comment on the limited nature of Smith's (1988) critique of the managerial use of the electronic point of sales systems (EPOS). It is essential for Orlikowski and Baroudi (1991) that the critique of the technology should indicate clearly how workers could resist the managerial use of EPOS. The researcher has a responsibility to enlighten those that suffer under managerial oppression.

2.4. *Question of validity*

Since critical research does not aim at the establishment of general laws of human behaviour, validity cannot be defined in terms of verification or falsification where

theoretical statements are measured against empirical evidence. Critical research wants to go further than interpretive research for which the question of validity coincides with the ability to provide a “rich account” of a situation without reference to “objective” empirical data. Critical research wants to return in an important way to the empirical because it aims to make a real difference to a situation. This difference is measured against the requirements of justice and the question whether a more humane society is being established. The soundness of critique is measured against the extent to which a more humane or emancipated situation is brought about. The soundness of the theoretical analysis should be collaborated by the oppressed that experience the effects of transformation.

2.5. *Basic assumptions in critique*

Each of the critical approaches could be analysed and compared in relation to the basic assumptions they make about reality and epistemology. The ontological question deals with the nature of reality and how it comes into being. The epistemological question deals with our knowledge of reality. Two extreme positions could be identified in both cases. A realistic view of reality implies that things such as natural objects, societal structures or information systems have an objective existence independent of the humans affected by them. These entities have a nature of their own and shape the actions and beliefs of humans. In relation to IS it means that they have an objective existence, an inherent nature and that they determine human actions and beliefs, even though they may be designed by humans. The implications of such a realistic ontology on conceptions of technology will be investigated in Chapter 3.

A constructivist (relativistic) ontology, present in interpretive research, holds that reality is a social construction. Even though objective entities may exist out there, they only become effective once they are mediated through human meanings and constructions. The distribution of power in society exists in the way humans create social relations and distribute resources. The social constructiveness of reality also appears in postmodern forms of the discursiveness of reality, or in the view of technology as a “discourse of power”.

Different conceptions of the nature and possibility of critique relate to different ontologies. In realist ontology, critique focuses on the substantive entities and underlying structures that contribute to injustices. In constructivist ontology, critique focuses on human meanings and attempt to make people think differently. In this case, critique focuses on meanings and understanding and not on supposed underlying structures. Once the oppressive implications of meanings are identified and made explicit people are in the position to change them. Since the contexts within which humans and technologies function, are socially constituted, they could be challenged and changed through social means such as communication and the uncovering of assumptions and beliefs. A different way of thinking leads to a different construction of reality and therefore to different technologies. In postmodern views certain elements of constructivism is taken to a further level. Postmodernism agrees with constructivism that reality is constructed by humans, but takes the constructivist principle further by postulating multiple, fragmented and mutually incommensurable realities.

This general analysis of critique provides the backdrop for the study as a whole since the themes and issues described here reappear in various ways in the different critical traditions. The following section describes how these themes are addressed in CRIS.

3. The changing field of critical research in IS

The critical tradition in ISR draws heavily on the critical approaches developed in Critical Management Studies (CMS) (Alvesson & Willmott 1992c). It should be noted that critical research takes a marginal position in ISR in general. This is indicated by the survey of paradigmatic approaches in articles in mainstream IS journals by Orlikowski & Baroudi (1991) and by Chen & Hirschheim (2004). The marginality of critique raises questions about its relevance in and impact on IS in general. Critical research is usually contrasted with positivist and interpretive research. Orlikowski & Baroudi (1991) and Cecez-Kecmanovic (2005) compare the three research paradigms on the basis of their respective ontologies, epistemologies, methodologies and their views on the relation between theory and practice. They

make a case for the distinctiveness of critical research and defend its basic assumptions.

Critical perspectives in IS took a key from the way research paradigms were defined in organisational studies in the seminal analysis of Burrell & Morgan (1979, 1985). Burrell & Morgan (1979) identify four mutually exclusive paradigms of social research in organisations, namely the functionalist, interpretivist, radical humanist and radical structuralist paradigms. They organise these paradigms in four quadrants with the distinctions subject/object and regulation/change as the axes. They saw the latter axis as an important addition to the dominant exclusive focus on the positivist subject/object distinction because it introduces the social dimension. The radical humanist (subject/change) quadrant is regarded as the important critical paradigm since it focuses on the human subject's role in changing social organisations. In this way they add the social dimension to the research of organisations and systems and therefore the critical dimension. Although Burrell & Morgan had opened intellectual space for a critical approach, they found that it has not been widely explored in ISR.

Drawing on the work of Burrell & Morgan, Hirschheim & Klein (1989) provide an overview of paradigmatic approaches to the development of information systems. Their analysis consists of the uncovering of assumptions inherent in different approaches to the design of information systems. They name the four categories correspondingly: functionalism, social relativism, neohumanism and radical structuralism and the axes objectivism/subjectivism and order/conflict. Radical structuralism falls in the conflict/objectivism quadrant and reflects the dialectical materialism of Marx. Neohumanism falls in the conflict/subjectivism quadrant and is based on a Habermasian approach where the categories of work, communication and emancipation open the possibility of critique. Hirschheim & Klein (1989) concur with Burrell & Morgan that the critical approaches, based on the latter two categories, have not been adequately explored. They are in favour of the utilisation of different paradigms in a complementary way in the development of information systems.

The intellectual space that was opened up by these four authors was in a limited way filled by various critical studies based on Critical Theory (CT) as represented in Habermas' theories of knowledge, social action and communication. The theoretical

underpinnings of this approach are described by Hirschheim, Klein & Lytinen (1996). In spite of these strong theoretical bases of critique, the general lack of critical approaches in IS is indicated by Klein & Hirschheim (1991). They observe that although research into IS identifies the ways in which communication is restricted; it does not explicitly address the issue of emancipation. They report later (Hirschheim & Klein, 1994) that although the importance of neohumanist approaches is acknowledged, no study has been published to show how it should be implemented in information system development (ISD). This is confirmed by Orlikowski & Baroudi (1991) who did a survey of articles in IS journals in the period 1983 – 1988. They found that 96.8% of the articles were based on a positivist research paradigm, and the rest were of an interpretivist nature. No critical studies are reported in this overview.

The critical approaches in IS seem to have grown in the following ten years after which Brooke (2002b, 2002d), in her overviews of critical approaches, indicates that they have broadened their theoretical base. Although the Habermasian approach is still dominant, critical approaches also draw in a marginal way on interpretivist, post-modern and textual approaches. These approaches provide fundamental challenges to the conceptions of power and the possibilities of emancipation in CT. Brooke (2002d:271) finds that the definition of 'critical' has broadened and that many more research paradigms now regard themselves as such.

Even though some growth was present, Richardson & Robinson's (2007) survey of critical research in information systems in the period 1991 – 2001 revealed only 31 critical articles published in the most important IS journals. They confirmed Brooke's finding of a plurality of theoretical approaches in critical studies and of the dominance of Habermasian approaches. They also found, however, that there is not a clear and common understanding of what critical research in information systems is and that the meaning of a key concept such as "emancipation" is not clear. There is also no clarity about the theories that should be used for critique (Richardson & Robinson, 2007:262).

A plurality of critical approaches on the basis of other theoretical bases has been developed in ISD in the past decade. This includes approaches which draw on Bourdieu's critical sociology (*i.a.* Richardson & Howcroft, 2006), or on the Critical

Realism of Bhaskar (*i.a.* Mingers, 2001). Critical approaches has also drawn on Structuration Theory (*i.a.* Orlikowski, 2000), on a combination of Structuration theory and ANT (*i.a.* Jones, 1999), and on Foucault (*i.a.* Doolin, 1998; Brooke, 2002d).

From this brief overview it could be seen that critique has become more complex and diversified and that one cannot talk any more of a single critical paradigm. Although some concerns have been raised about the plurality of critical approaches and attempts have been made to promote methodological coherence, the multiplication of critical approaches has generally been welcomed. It will be indicated in Chapter 6 that ANT both contributes to this variety and provides a positive perspective on it.

4. Structuralism

The attention turns now to a more detailed discussion of the various paradigms in critical research. In all cases the basic assumptions will be discussed as well as the particular ways in which they respond to the basic issues mentioned in Section 2.

Critical traditions in IS have their origin in Marxism. The possibility of a classical Marxist approach in information systems research was envisaged by Hirschheim & Klein (1989) who allocates a space to dialectical materialism or to the radical structuralist perspective. Structuralism (Marshall, 1998) in the social sciences refers to underlying structure that strongly influences human actions and beliefs. The structuralist materialism of Marxism relates to the way the economic relations and means of production form the base which determines the superstructures such as culture, the state, belief systems and ideologies. In the capitalist economic system the means and relations of production are distorted and resulted in the existence of two opposing classes. The workers are alienated from the products of their labour and the capitalists (managers in their place) exploit the means of production in order to accrue capital at the cost of the worker. These distorted relations are kept in place through ideology which both conceals and justifies the social contradictions. The concealment is reflected in the “false consciousness” of the workers who normally do not see how their labour accrues a surplus for the capitalist and believe that they receive a fair wage. It is only through a process of conscientisation that they could become aware of the ways in which they are exploited and that could trigger an overt class struggle.

In accordance with the structuralist/Marxist view, the functioning of information systems in organisations reflects this class struggle. An example of this is when managers develop information systems which refine and intensify the exploitation of workers as (human) resources. This is illustrated in the use of mobile technologies where even the “free” time of the worker is more efficiently used for the benefit of the accumulation of capital (see Mitev, 2006).

In the Marxist view, the liberating potential of technology could only be realised when ownership and control changes. If technology has to be employed in a critical way, it has to side with the working class interests. The principle that capitalism and managerialism could only be overthrown by the workers was translated into various worker-based approaches to technological development and change. Hirschheim & Klein (1989:1200, 1206) discuss the example of typesetting technology in the UTOPIA project where worker interests are taken to be of paramount importance and where technological development aimed at minimising the control of management. The development and employment of technology here sided with the struggle of the workers to obtain control of their own work. In this project the new typesetting technology was designed in such a way that the typesetters were not deskilled, but their craft was enhanced. The structuralist elements in this account refer to the identity of and relation between workers and management and the notion that design should be done by either the one or the other since their interests are necessarily in conflict. Hirschheim & Klein (1994) also report on various projects in which participatory design favours the voice of workers and trade unions. Various studies were also done of technology projects in Scandinavia where workers were placed in the position of control (Lyytinen, 1987:30).

Although the Marxist position laid the groundwork for subsequent critical approaches, it was limited in various ways. The structuralism of Marxism makes it difficult to activate the revolutionary agent who is always caught up in the determinism of structures, natural laws and technologies. The agent of change is identified in class terms as the worker, seen inevitably in an essentialist way. The essentialism does not recognise that the identity of the worker (or of the capitalist) may change through the changes in technology and economic processes. Marxism operates with a clear definition of the oppressive ruling class, the contribution of technologies and the meaning of emancipation. The basis of critique lies in the

interests of the workers and emancipation in workers' control of technology. Technology must be transformed from an instrument in the hands of the ruling class to an instrument which enhances the creative work of the workers.

Elements of structuralism reappear in later critical accounts where ideology is understood to shape thought and behaviour. People are said to be unaware of the ways in which their actions and beliefs are shaped or determined by ideologies. They need critical enlightenment to inform them of the real nature of their oppression and to enable them to resist oppressive structures.

5. Critical Interpretivism (Constructivism)

Critical interpretivism and critical constructivism are discussed together because of the similar way in which they perceive humans as interpreters and constructors of meaning. In contrast to the structuralist approach in Marxism, the human agent as a free constructor of meaning is the basis of interpretive approaches based on the hermeneutics of Gadamer. It differs from the structuralism of Marxism in the way the human subject constitutes the world through the making of meaning, the construction of knowledge and of technologies. An interpretive approach to IS focuses on the way agents develop an understanding of the whole and their place within it. Knowledge of any object is only available through the meanings attributed to it. Central processes in these approaches are communication and social interaction. Interpretive approaches are found in Constructivism, Ethnographic studies, and Hermeneutics.

The interpretivist paradigm in IS research has provided an important alternative to the dominant positivist approach based on technical rationality. In contrast to positivist design it shifted the focus to the way system design reflects human meanings and intentions. The human actor takes central stage not as a manipulable entity, but as a constructor of meaning (see Howcroft & Trauth, 2004:199). Since the construction of meanings by people is central, the researcher is not to impose a theoretical framework on them. This translates into a relatively passive role for the researcher as observer, recorder and describer of meanings. The role of the researcher is not denied, but it demands reflective awareness of own prejudices and organising devices. According to Walsham (1993:4,5) interpretive methods in IS are

aimed at producing an understanding of the *context* of the information system, and the *process* whereby the information system influences and is influenced by the context.

Interpretive approaches are widely used in IS as indicated by McGrath (2005:87):

Such beliefs are consistent with the socio-technical approach, pioneered by members of the Tavistock Institute in London, and developed and modified by Mumford and colleagues in the UK ... and several researchers in Scandinavian countries ...

Interpretive approaches refrain from critical questioning because that would impose the researcher's values on the research terrain. The inherent inability of interpretive approaches to render critique is identified from the perspective of a Habermasian framework which distinguishes between practical (interpretive) and emancipatory (critical) rationality. According to this scheme, the hermeneutic sciences only attempt to interpret and understand the meaning making of the subjects without addressing issues of power and emancipation. According to Mitev (2006:310) an approach which mainly focuses on the subjective processes of meaning-making cannot be critical or transformational. In relation to Alvesson & Deetz's (2000) three elements of critique, the interpretive approaches are limited to the first stage of "insight" and do not address "critique" or "transformation" (see also the critique of McGrath, 2005; Orlikowski & Baroudi, 1991). Klein & Myers (1999) found many interpretive approaches uncritical because they do not adequately contextualise the research.

This limitation of interpretive approaches is highlighted in McGrath's (2005) analysis of Orlikowski's interpretive study of Lotus Notes where the transformation effort is not problematised according to McGrath:

One form of a limited critique would question whether an outcome increasing managerial control was desirable to all. In effect, it would challenge Orlikowski's assumption that, whatever their tactics, actors constructed reality in terms of an overall goal of achieving organizational effectiveness, hence economic success of the firm. (McGrath, 2005:91)

For Burrell & Morgan (1979), interpretivism employs a "regulation theory of society" which does not address issues of power. In a similar way, Howcroft & Trauth (2004:199) find that interpretive approaches do not succeed in addressing relations of power and control which underlies the socially constructed meanings. Howcroft & Trauth (2004:201) state that an interpretivist approach to the issue of gender in IT focuses on an understanding of societal difference and not on the questioning of

these differences. For Winner (1993:370) social constructivism does not provide the means to recognise how technological development favours the interests of some while excluding others.

In order to address these limitations, critical interpretivism (Doolin, 1998), critical hermeneutics, and critical ethnography (Myers, 1997) have been developed. Critical interpretivism does not limit itself to the accounts of participants, but looks more carefully at ways in which these accounts are shaped by the broader context and how the deeper and hidden meanings could be extracted. Mitev (2006:311) refers to various examples of critical interpretive research such as the uncovering of hidden agenda and deep structures, and reports that they “attempt to move beyond the immediate narrative of the subjects to the broader historical, social, and cultural processes within which narratives are embedded.”

The meaning of critical interpretivism is extended by Klein & Myers (1999:72) who identify seven methodological principles underlying interpretive methods of research in IS, such as the hermeneutical circle, multiple perspectives and contextualisation. They emphasise the need to see the seven principles in a holistic way with the principle of the hermeneutic circle as the central one. According to them it is only the seventh principle, the principle of suspicion, that is critical because it aims to uncover “false consciousness”, biases and distortions in the narratives of the participants. According to them (Klein & Myers, 1999:78) researchers move beyond merely interpreting the data in order to “...’read’ the social world behind the words of the actors, a social world that is characterized by power structures, vested interests, and limited resources to meet the goal of various actors who construct and enact this social world”. The critical perspective has to go beyond the views of the participants and uncover something they are not aware of and which is located in social structures.

Turning to critical ethnography, Alvesson & Willmott (1992b:454) states that the value of ethnography lies in the way it enables researchers to listen to people directly involved in the practices under investigation. Ethnography is critical when it does not take people’s accounts at face value, but when it is sensitive to how meanings may carry privileged interests and convey unequal relation of power.

The work of Walsham who is one of the prominent IS researchers that follows a critical interpretive approach, could be used to illustrate this kind of critique. Critique starts for him with an in-depth investigation of the IS phenomena. Walsham (2001) is concerned about the uneven way ISs are present in the global context. He (2005:113,4) is concerned about the digital divide, and the way dominant western technology are imposed on the third and fourth worlds. He focuses on issues such as asymmetries of power, alienation, disadvantaged groups, structural inequity, power relations between groups, the hierarchical organization of work and the problems related to surveillance and control. He regards critical research as separate from and parasitical on mainline research. Walsham (2005:115) believes that no one particular critical theory should be developed in IS as an applied terrain, but critical theories could be drawn from other areas such as sociology, anthropology or psychology. The central issue is whether issues of power are addressed. Walsham (2001) uses the constructivist view that meanings are embedded in technology and that these meanings are transferred with the transfer of technology. Technology is not only used in an instrumentalist way, but users are forced to share the embedded beliefs and values. Walsham takes a positive view of different cultural traditions and beliefs by stating that these should not simply be replaced by the values embedded in technology. The solution for technology transfer lies in a careful interaction between developers and local groups which does not aim to preserve the respective cultures as such, but to find different kinds of compromises. The local culture cannot simply be overruled by technology, nor should negative elements in a culture such as authoritarianism or racism be left intact. Walsham employs in his critical interpretivism certain theoretical perspectives. This is in line with the view of Klein & Myers (1999) for whom interpretive approaches do not aim at the formulation and validation of theories that are universal and abstract, but use them as sensitising devices (Klein & Myers, 1999:75). In line with this, Walsham draws on the theories of Giddens (1984) and Beck (1992) to provide him with insights into the broad traits of contemporary (globalised) society and these enable him to interpret aspects of the cases he studies. His interpretive work is therefore critical in the way it goes beyond the statements of participants to identify the broader contexts without which it could not be adequately understood. He also follows Klein & Myers' (1999) strategy of multiple interpretations to provide a richer account of IS.

It is clear that critical interpretivism draws here on structuralist elements which exert an influence on the actions and beliefs of actors. According to this the meanings actors make cannot be taken at face value, but have to be subjected to the suspicion that they are shaped by underlying factors such as interests and power, or by global trends such as the risk society, and that they could reveal social contradictions. To locate an object of research against such contexts is to ask about those factors external to the particular system which may have an influence over it. Context is then understood in terms of ideologies and social, political, cultural and economic conditions. Seen from this perspective, an information system may then contribute towards the perpetuation of contextual factors such as social inequalities or to the entrenchment of ideologies that hide and justify such inequalities. In this way interpretive research obtains an element of critique once it is not limited to an account of the meanings of the actors, but locates these meanings against relevant contexts or relates them to certain interests.

6. Critical Theory

The comparison above of interpretivism, constructivism and their critical versions is important for an understanding of ANT and of the way ANT conceptualises critique. It is important to note that critique does not need to be colonised by Critical Theory, but that other avenues have been explored. The main point of reference for critique remains, however, Critical Theory to which we turn now.

6.1. *Theoretical roots*

Modernistic forms of critique such as Critical Theory developed by the Frankfurt School (Horkheimer, Adorno, Marcuse and Habermas) continue with the enlightenment project of the rational uncovering and exposure of the idols of reason (Bacon, 1915), distorted forms of reality and origins of unhappiness. Critique is based on the ability of reason to uncover in a self-reflective way false assumptions and contradictory practices. Once the conditions that contribute to unhappiness are identified and understood, changes could be brought about. These conditions are inherent in dogmas and traditions which limit the unfolding of reason and freedom. A particular social and historical reality which is the manifestation of the limitations of

reason, should be overcome and transformed. The purpose of critique is couched in negative terms as freedom from ideology, tradition, oppression, power and inequity and described positively in terms of emancipation². Although this positive notion of freedom is implicit in all critique the tendency exists to avoid specifying what an emancipated state might look like. Emancipation becomes possible when a level of self-insight into the conditions of the own situation is achieved. From the position of clear illumination of the current conditions within its historical and structural context transformative action could be taken.

The Frankfurt School is an important reference point for any consideration of critique since central concepts such as alienation, emancipation and domination, and processes such as the critique of ideology are defined. Fay (1987) identifies a critical social science as presenting critical theorems on the basis of which forms of distortion and domination could be identified and emancipation formulated. Emancipation is needed of inner psychological states and of external forms of oppression. Emancipation in this scenario is

a state of reflective clarity in which people know which of their wants are genuine, because they know finally who they really are, and a state of collective autonomy in which they have the power to determine rationally and freely the nature and direction of their collective existence.
(Fay, 1987:205)

In relation to critical theory, a distinction is made between the first and second generation of the Frankfurt School (Klein & Hirschheim, 2008:7). Whereas the first generation refers to Adorno and Horkheimer and emphasise negatively what critique should target, the second generation, which became very influential in CRIS, draws on the theories Habermas and emphasise positively what critique should aim to achieve. In this way Critical Theory contributes in both a negative and positive way to research and development of information systems. Negatively it alerts to the factors on individual and social level that limits individuals to realise their potential, and positively it attempts to identify the processes of emancipation. Whereas the first generation of the Frankfurt School emphasises critical insight into constraining

² See Berlin (2002) for the distinction between negative and positive freedom.

elements such as alienation, false consciousness and contradictions, Habermas develops a positive notion of emancipation on the basis of communicative action.

6.2. Habermas

Habermas continues with the project of the Frankfurt School in his own way and deserves special attention since most critical approaches in ISR are based on his theories (Brooke 2002b) starting with the work of Hirschheim & Klein (1989) and Lyytinen & Klein (1985). With his colleagues of the Institute for Social Research at Frankfurt, Habermas addressed the problem of emancipation and domination on the basis of a critical social theory. Habermas differed from his colleagues who compared the status quo with a preferred state in that he focuses more on the process of emancipation based on a theory of language.

Lyytinen (1992:164) identifies two areas of critical research which relate to Habermas' ideas. The first is "critique of scientism and relationships between theory and practice", and the second deals with the nature of social action and corresponding types of knowledge. He reports however, that much of the research is fragmentary and remains in the sphere of theory.

6.3. A critical social science

Habermas' critique of scientism is based on his distinction of three knowledge-constitutive interests: the technical, practical and emancipatory, which arise from the two fundamental kinds of activity of labour and communicative interaction. The emancipatory interest is about the attainment of freedom through self-reflectivity and communicative interaction which could result in liberation from power, domination and alienation. The theory of knowledge-constitutive interests relates to different kinds of science. The natural sciences are based on the technical interest and typically search for the laws of nature in an attempt to exercise control and to make successful prediction about natural events. In contrast to this, the hermeneutic sciences are based on the practical interest and search for understanding of human actions and institutions. The emancipatory interest is present in sciences that question ways in which power distorts human relations and is the key to critical research. Habermas' distinction between three knowledge-constitutive interests and

his rational foundation for the distinction and justification of empirical, interpretive and critical sciences opened the space in ISR to challenge the dominant positivistic research paradigm.

The positivist paradigm focuses solely on the technical interest in prediction and control and the employment of this paradigm in ISR is based on the assumption that information systems are similar to natural phenomena. The imposition of the positivist paradigm on all sciences, called scientism, provided only sciences based on the technical interest an exclusive legitimacy. The critique of Habermas on the dominance of technical rationality together with his rational foundation of interpretive and critical science extended the scope of legitimate science. His critique of scientism was in itself an important achievement in the light of the dominant position positivist research still has. The importance of the intellectual space that is created for alternative approaches should not be underestimated. Habermas' theory of knowledge interests has also made it possible to conduct legitimately interpretivist and critical research in information systems, although the latter has not been developed strongly according to Lyytinen (1992).

6.4. *System and life world*

The second theme Lyytinen (1992) identifies relates to the nature of social action. Habermas (1984) distinguishes the spheres of systems and life world on the basis of their different kinds of rationalities. Life world is the terrain of culture, freedom and authenticity and is characterised by symbolic meaning making and communicative rationality. Systems such as the economy and administration arise from the life world as arenas of action and are guided by life world concerns. The steering media of money and power operate in a system which is characterised by instrumental rationality which aims at success, efficiency and control. Colonisation of the life world takes place when the "delinguistified" media of money and power, become the dominant reproductive forces replacing the symbolic meaning making processes of the life world. The operation of power in systems undermines the open and free communicative rationality of the life world. This leads to different forms of pathology such as alienation and loss of legitimacy. It is therefore important for the emancipatory project to protect the life world from the intrusion of instrumentalist and rationalist systems.

This aspect of Habermas' views is widely represented in the IS literature of which Wilson (1997) is one example. He emphasises that human beings have

a "practical interest" in securing and expanding the possibilities for mutual understanding and an "emancipatory interest" in freeing themselves from constraints imposed by (systems supported) power structures and in learning, through a process of genuine participatory democracy, to control their own destiny.

6.5. *Communicative action*

Habermas' linguistic turn implies that the possibility of emancipation is already in the structure of language, and it could therefore be brought about through communicative interaction. Within the structure of language, which everyone shares, are the requirements of open and free communication. Freedom and rationality realises fully when communication is undistorted according to the requirements of the "ideal speech situation" which is free from domination and personal interests. Habermas defines the conditions which a speech act should meet in order to comply with the requirements of ideal speech. He identifies the characteristics of this kind of interaction such as open and free discussion where the own interests and assumptions are made explicit. Although this description is utopian, it provides a guiding principle for the realisation of emancipation which may never be reached to the full extent. The rules constituting the ideal speech situation entail that people participate in a perfectly symmetrical and reciprocal way, divorced of power and personal interests, with the aim to establish the validity of claims. While each statement claims universal validity, it is subjected to testing by others. The full and equal participation of everyone in this process may lead to consensus about validity. This dialogue between equals ensures the rationality of the statements and goals. Emancipation is possible when the conditions of the ideal speech situation prevails and where insights are freely and truthfully interchanged. The possibility of emancipation also exists when the problem of power and domination, typical of the system, is overcome in the free communicative interaction. The sphere of free interaction is not merely idealistic, but it has the potential to change the structures of society. Habermas avoids specifying exactly what the emancipatory state should consist of and focuses more on the process of emancipation through undistorted communicative interaction. The emancipatory interest is therefore rational and

universal and could be compared with the technical and practical interests. To act rationally is therefore not only to act in accordance with instrumental rationality, but more so to act in accordance with the emancipatory interest.

The theme of communicative interaction appears strongly in CRIS. Lyytinen (1992:169) provides an account of a study by Lyytinen & Hirschheim (1988) which investigates IS to support the ideal speech situation. For Hirschheim & Klein (1989:1207) the “goal of information systems is to help with the institutionalization of an ideal speech situation which in turn validates a consensus about system objectives and modes of design and implementation”. They describe some elements of information systems such as data modelling or networks that could help to overcome limited and distorted communication. An emancipatory information system design deals centrally with individual and social constraints which cause communication distortions (Hirschheim & Klein, 1994).

In line with the three knowledge-constitutive interests, Lyytinen (1992:165) reports on the impact on ISR of Habermas’ distinction between different action types, purposive rational action (instrumental and strategic action), communicative action and discursive action. Where purposive-rational action aims at the control of things (instrumental action) or people (strategic action), communicative action aims at mutual understanding based on common background knowledge. Discursive action takes place when the shared background knowledge is not present and aims at the cooperative search for truth. Discursive actions aim at rational consensus based on free participation of all involved. Research on the basis of the notion of communicative action shows how information systems contribute towards distorted communication and how it could contribute to the ideal type communication. ICTs are seen as important means towards distorting or opening up communication and therefore have a very important role to play in the communicative processes aiming at emancipation.

These ideas are pursued in conceptions of participatory democracy based on the rational interests where open and free dialogue, free from power and irrational interests takes place. Investigations were also done of ways in which communication is made richer and more accessible and how people are connected. Ngwenyama & Lee (1997) investigated communication richness in electronic mail and the ways in

which actors are emancipated from distorted communicative acts. Since the process of emancipation lies in communicative interaction guided by the ideal speech situation, an IS should, according to Wilson (1997), provide the opportunity to communicate freely so that information could be distributed equally in an organisation. The IS should enable free flow of information, communication free from domination and power, an equal opportunity for everyone to participate, guided by the power of the better argument. The central question in the design of technology is whether it contributes to the ideal speech situation which overcomes the hierarchical nature of organisations. The use of technology such as information systems in organisations should enable and enhance open and free communication. Wilson (1997) concludes:

In summary the aim in all these methodologies is to create EIS [electronic information system] designs which will promote disinterested dialogue about matters of common participant concern. Thus the emancipatory methodologies should enable the participants within the design situation to gain an insight into the perspectives guiding practitioners' behaviour. It is proposed that a critical assessment of these perspectives promotes debate, enhances practitioners' self-knowledge, and hopefully generates more reflective, and thus more informed types of action.

6.6. *Emancipation*

Emancipation is a central motive in critical theory as summarised by Fay (1987:205), it is

a state of reflective clarity in which people know which of their wants are genuine, because they know finally who they really are, and a state of collective autonomy in which they have the power to determine rationally and freely the nature and direction of their collective existence.

According to Alvesson & Willmott (1992b:432) the meaning of emancipation in the context of the Frankfurt School entails

the process through which individuals and groups become freed from repressive social and ideological conditions, in particular those that place socially unnecessary restrictions upon the development and articulation of human consciousness.

Emancipation entails the transition from a situation of unfreedom, alienation and oppression to one of freedom, self-determination and autonomy. The possibility of

emancipation is based on the principal that it is possible to be freed from power and oppression and to become fully self-determined.

Closer to ISR, Hirschheim & Klein (1994) report on various information system design projects which contain elements of emancipatory design and define four requirements for such design. By means of a critical reformulation of the basic assumptions and methodological principles of the approach to IS design in ETHICS, they want to rectify the idealistic conceptions of emancipation in critical theory. They provide a concrete strategy for the further development of emancipatory design by showing how an incrementalistic approach to emancipation could be understood and realised in design strategies. Through a critical reformulation of the theoretical and philosophical assumptions underlying ETHICS, they show how an existing design methodology could be changed to reflect emancipatory principles more fully.

For Richardson & Robinson (2007:263) the researcher cannot be separated from the actual process of transformation and should be involved with the “radical movements”. The central question here is whether “it (is) enough to critique or do critical researchers have to overturn oppressive social relations and change the world?”

7. Post CT approaches

7.1. *Basic themes*

Various problems have been identified with the approach of CT to critical research in IS. Some of these critiques come from within CT and others from postmodern or poststructural perspectives. The critique does not mean that CT has become obsolete or that clear alternatives have developed. The “post” in the heading refers rather to the multiplication of critical approaches that challenge central motives of CT. They either attempt to refine some elements of CT or to draw on other theoretical perspectives in order to overcome the perceived limitations of CT. The post-critical approaches cannot be simply labelled as “postmodern” because many of the typically modern beliefs of CT are still present. In this section the continuing debate about central elements of critical approaches is followed to indicate how critical researchers grapple with the nature and possibility of their research.

Poststructuralist and postmodern theories provide a challenge that necessitates a rethink of notions of power, emancipation and rationality. Power is not only seen as oppressive and dominating, but as an ambiguous productive force. The consequence of the notion that power is also not located at the centre, but flows throughout an organisation, is that everyone always is within networks of power. The modernistic metanarratives of freedom and emancipation are questioned since any attempt to promote freedom has potential dominating implications (Lyotard, 1984). A situation of emancipation, as described by Fay, is not possible since a stage of self-insight cannot be achieved. It is not possible for the reason to obtain truth by uncovering and eliminating falsehoods, false consciousness or ideologies. The “grand narrative” (Lyotard) of modern critique is oppressive because it excludes the marginal voices. Any narrative or system of ideas is a “regime of truth” (Foucault, 1980) with its own exclusionary and possible oppressive consequences. Power and knowledge cannot be neatly separated since every claim to know already implies relations of power. Postmodern critique appears in the form of deconstruction in which the conditions which made truth claims possible are uncovered. Critique is also an analysis of the operation of power in a specific context in order to show how power produces identities. Since critique cannot be based on universal reason for the postmoderns, the voices of “the other” (Levinas, 1985) has to be heard even though it is usually not commensurable with a dominant form of rationality. The process of critique lies in the multiplication of voices which open the space for different forms of resistance. The macro-emphasis of modernity is replaced by attention to local struggles in a particular context. Postmodernism questions modernity’s tendency to essentialise human nature in its definition of autonomy and freedom.

From the perspective of CT poststructuralism has been criticised on the basis that it makes any notion of critique impossible and that we are left with fragmented narratives that do not support a project of emancipation informed by a perspective that transcend the situation. From the post CT perspectives, the main critique of CT relates to its universalism, the lack of conceptualisations of power, and the difficulty critical theorists experience to relate abstract theorising to empirical analysis.

7.2. Power

A central criticism of CT is that the way power operates within the social context is not adequately understood. The possibility of a state of power-free undistorted communication is questioned, as well as the mainly negative view of power. Various voices within the tradition of critical theory showed an awareness of its limitations. Hirschheim & Klein (1994) states that Critical Theory cannot deal with the “darker sides” of organizational life, such as when vested interests and power block the road to emancipation.

Wilson (1997) provides a critique of the Habermas-inspired approaches to information systems design in relation to the concept of rationality and power. He regards the notion of emancipation a powerful metanarrative which postulates the absolutism of reason. He provides criticism of Hirschheim & Klein’s ideal of the ideal speech situation since it imposes a metanarrative for which no ultimate justification exists except in the mind of the “experts”. Such a grounding of rationality denies its locatedness in a particular history and society. It is therefore not possible to ultimately justify rationality any more than other concepts such as freedom and autonomy. In this sense the critical approach of Habermas does not differ from the positivists’ approach because they also claim expert and absolute knowledge. The ultimate question about this approach is caught in the phrase: *quis custodiet ipsos custodes* (Wilson, 1997). In opposition to the negative view of power, Wilson draws on Foucault to highlight the relational aspect of power through which the social is constituted and according to which power both constrains and enables. Wilson shows that, by denying the integral and necessary role of power, Emancipatory Information Systems Design (EISD) fails to recognise the many ways in which power shapes the social. It does not succeed to indicate how distortive power relations are to be made explicit and addressed and merely assumes that an ideal speech situation will be reached once communication is open and free. It is for, Wilson, problematic that the totalizing discourse of CT implies a merge of the different views, values, and interests into a consensual truth. This is for Wilson the end of politics. For Wilson, the EISD replaces the positivistic myth of objective truth with an equally totalitarian approach which does not recognise the need to justify itself.

Similar kinds of critique of CT have been rendered by other authors as well. For McGrath (2005:89) CT wants to remove distorted communication “without having adequate mechanisms to analyse the power relations that gave rise to them in the first place”. While for Brooke (2002b), the central issues in critical research are power and emancipation, the concept of the ideal speech situation is in principle not possible because of the way it denies the pervasive role of power. A conception of communication and human interaction which excludes the inherent role of power is, for Brooke, deficient. It is based on the belief that undistorted communication is possible if agents only succeed in distancing themselves from power. She finds that these aspects are not adequately addressed in a Habermasian approach and wants to broaden critical research from the “over use” of Habermas by drawing on some of Foucault’s notion of power. This critique of Brooke has important implications for the way technology could be developed. It is essential for Brooke (2002b) that a critical approach to technology takes the role of power into account. She finds Habermas’ conception of power limited and argues that Foucault provides an account which makes it possible to see the ambiguous nature of power and the mechanisms of power within a particular situation. The ambiguity of power lies in the realisation that power is not only implicated in domination, but it is also a positive, productive force. What is more is that these two functions of power cannot be clearly separated. A theory of critique based on the views of Foucault intensifies the need for self-reflection because the outcomes of the production of power (as in research) cannot be predicted. The consequence is that research with an emancipatory intent does not necessarily lead towards emancipation. The Foucauldian notion of power also makes it possible to see that power is not only located in one place, such as that occupied by a manager, but it is distributed throughout the organisation. The fluidity of power implies that it cannot be contained, but flows in unpredictable ways and directions. The poststructuralism of Foucault entails that critique cannot penetrate to a deeper structure which reveals the real motives and interests. Brooke (2002b:55) summarises the differences between Habermas and Foucault as follows:

In summary, then, it could be argued that Foucault’s approach to emancipation seems less naïve, in that he recognizes the role of unequal power relations and the potential for contradictory outcomes. Habermas evaluates power in abstraction from its underlying processes whereas Foucault more directly analyses power relations themselves and the forces of domination that result from inequalities in power.

Brooke appreciates the way Foucault makes self-critique possible by showing how the general theories and prescriptions position themselves beyond critique. Foucault shows how these discursive practices blend power and knowledge in the establishment of a regime of truth. This conception of power makes a different notion of agency possible. The agent is able to reflect on its own place within the larger context and on the ways in which this place is produced by power. This analysis also makes it possible to locate power outside the human agent. This perspective challenges many of the taken for granted positions in critical research. It challenges the belief that emancipation is forthcoming from research and that emancipation consists of the absence of power.

Doolin (1998, 2004) was also one of the theorists to draw on Foucault to develop a critical perspective in ISR. Where Habermas relegates power to the sphere of system and portrays the life world as free from power, the presence of power is, according to Doolin, central to the work of Foucault. Foucault does not see power only as a negative force in relation to domination, but sees it also as a productive force through which identities are produced. Doolin (1998) draws on Foucault's notion of power to argue that researchers need to be critically aware of the way IT maintains social order and power in organisations. IT is both a "condition and a consequence of power relations". For Doolin, it is necessary that the black box of IT be opened so that the power relations inscribed in it could be scrutinised.

Mitev (2006) develops a position which attempts to combine CT and postmodernism by drawing on the work of Alvesson & Deetz (1996). She recognises the validity of CT's attempt to build consensus and the postmodern deconstruction of any consensus:

There are ways to think them both at once, though not necessarily through some new synthesis. There is a need for both conflict and consensus, for resistance and plans. To say that consensus implies domination does not mean that we should not make the best decisions we can together, but that we need to continue to look for domination. To say that resistance lacks a clear politics does not mean that it is not doing something important and ultimately may be the only way we can see through dominations that benefit and limit us. One option is to conduct multiple interpretations of the same phenomenon from both CT and postmodern positions, or see both as useful as inspiration for reflexivity rather than as theories directly relevant for guiding and interpreting studies of substantive matters. Alvesson and Deetz (1996) conclude that various paths are possible that address the middle ground between more

traditional realist and hermeneutic epistemologies, on one hand, and a postmodern philosophy, on the other hand. (Mitev, 2006:317)

It could be argued that Mitev avoids engaging with the deep differences between the two traditions, but he is consistently postmodern in the sense that different perspectives should be taken together without attempting to solve the differences.

In true postmodern fashion, Richardson & Howcroft (2006:144) explain critique as disruption:

The process of conducting critical research means disrupting ongoing social reality in order to question what is often ignored or taken for granted and gain a critical and richer insight into issues raised. It has been noted elsewhere (particularly in Critical Management Studies) that much of the research into organizational life has tended to conform or reproduce dominating institutions and interests. (Alvesson & Deetz, 2000)

7.3. *Emancipation*

Post CT approaches are also explicit but more cautious and modest about the possibility and meaning of emancipation. They realise that power is ambiguous and the best intentions could easily have undesired effects. They are also aware of the ways well intended research could contribute to oppressive outcomes. The discourse of emancipation has now become a 'discourse of possibility' (Cecez-Kecmanovic, *et al.* 2002) in IS practice. Critical research is not in the position any more to clearly show which emancipatory practices to follow, but wants to open the space where talk about different kinds of change becomes possible. Due to the demise of essentialistic views of human, substantive views of emancipation could not be provided any more.

Since the exact content of emancipation cannot be established, it functions now more as a heuristic device in critical research. Although no clear description can be given of an emancipated state, a conception of emancipation guides research. Critical research defines necessary conditions for the emancipatory process, but cannot state that these conditions are sufficient in any way. Whereas critical theory finds the necessary process of emancipation in rationality, the entanglement of reason and power in postmodernism negates any straightforward approach to emancipation.

Although a conception of emancipation is still present, Alvesson & Willmott (1992b:447) develop a different notion of emancipation to address the intellectualism, essentialism, and negativity attributed to CT. Their project remains rationalistic in the sense that they look for the possibility of emancipation in the ability to reflect critically. Instead of the macro project where emancipation is seen in a linear way, they rather talk about micro-emancipation. This refers to the possibilities present in any particular context to identify and realise emancipatory ideals that are only applicable to this context. Emancipation is no longer a universal project that crosses multiple locations, but has a particular meaning in every particular situation. The notion of micro-emancipation is also taken up by Cecez-Kecmanovic & Jansen (2008) in a longitudinal study of a retail company which they see as an exemplary case of participatory and emancipator EISD practices.

While emancipation is a central motive for Adam (2002), she wants to fine tune its meaning. It could be defined in terms of negative freedom as free from “oppressive and unwarranted expressions of power” located in power structures. However, she finds the Habermasian understanding of the emancipatory process problematic because of the generality of the ideal speech situation. Such a speech situation may serve to reinforce rather than alleviate oppression if it leaves the material conditions that cause the oppression in the first place unexplored. A more precise understanding of the concept would be acquired if it identifies and addresses particular structures of domination (Adam, 2002:62). The generalised and universal notion of an ideal speech situation does not allow for the inclusion of “subaltern” voices. These voices are crucial for a critical perspective since they are in a position to identify the hidden effects of a dominant structure. In this process she questions Habermas’ basic belief in the realisation of a situation where power is not present. Adam (2002:65) claims that those who are committed to the emancipation of a particular group may offer us radical insights into the world that may be of value to others, not just those in that chosen group. Adam combines the Habermasian quest for open and free communication with a structuralist quest for what remains beneath the surface. It is an acknowledgement that not everything could be made transparent through communication and that strategies should be developed to make the subaltern heard.

It is therefore important for critique that subaltern voices be included in the design of technology. Adam (2002:64) refers to various IS development projects which illustrates how the marginal voices of women are included. She refers, for example, to the “Florence project” where the dialogue between system designers and the nurses revealed the conflict between the nurses and doctors about the patient reporting system and draws on the insights of the less powerful nurses. She also refers to Vehviläinen’s (1997) proposed methodology for the design of IS based on study circles through which the subaltern voices could be articulated. Her reference to Green’s (1994) study of library assistants illustrates how subaltern voices contribute to potentially liberatory knowledge once they are taken seriously in system design. She also problematises the role of systems designers who cast themselves as the emancipators of system users who are not even aware of their need for emancipation. The emancipator role of the systems analyst is dependent on the subaltern voices (Adam, 2002:62).

Whereas a radical feminist view would claim epistemological privilege to women, Adam’s approach is to use the female-category to show how more voices should be included. Feminism contributes in important ways to the understanding of critique because it breaks with the universalism of Habermas and introduces the need for the inclusion of plural voices which provide perspectives that are sidelined.

7.4. *Theory and practice in critique*

A theme that arises regularly in the discussion of critique in IS, is the difficulty to bridge the gap between the theory and practice of critique. In relation to Critical Theory based on Habermas, Lyytinen (1992) reports that much of the research is fragmentary and remains in the sphere of theory. The quest for the practice of research is related to the quest for the empirical aspect of research.

The need for transformative practice is deeply embedded in critical theories going back to Marx’s (1969) thesis on Feuerbach that philosophy should not merely interpret, but change the world. The need for real transformation is included in Alvesson & Deetz’s (2000) definition of critique, and it is present in Klein & Myers’ (1999:69) account when they state that critique must be such “that people can consciously act to change their social and economic conditions”. These views

emphasise the need for the transformative practices to provide a context against which theories could be validated.

What complicates matters for critical research is its scepticism of a kind of empiricism that is not guided by normative theoretical perspectives. The validity of critical theories cannot simply be verified with reference to empirical data. Alvesson & Deetz's (2000:153) makes, for example, a sharp contrast between critical and empirical research. Howcroft & Trauth (2004:204) qualify empirical research by stating that the "grounding" of research on issues such as technological determinism in organizational contexts "could only aid our understanding of these issues". The positivist orientation where research is seen as a "mirror" of reality is replaced by the critical view where theory is seen as "lens". It leaves the question about the relation between research and the empirical if the researcher is always "positioned and active" (Howcroft & Trauth, 2004:204).

The importance of the empirical in critical research is emphasised by Richardson & Howcroft (2006:152):

We base our study on the central premise that critical research aims for a balance between being informed by critical theoretical ideas and a political agenda, and an empirical sensitivity and interest in the discovery of repression.

This sentiment is also expressed by Klecuń (2004:264):

The paucity of critical theory driven research in IS, in my opinion, is not only due to the neglect of ICT in critical theorists' writings, but also because critical theory is a meta-theory, built from many writings on different subjects. It does not prescribe specific methods for empirical research or offer detailed guidelines to follow.

McGrath (2005) argues for a closer interaction between theory and practice in research. The practice of critical research should contribute towards its theoretical conceptualisations. According to McGrath, Foucault's attempts should be located in this area. In her discussion of the critical research of Walsham and Avgerou, she argues that the researchers are not adequately reflexive about their epistemologies and methods in order to reflect on how critique is to be done. It is for her an important part of critical work to become aware of how the researcher is affected by the ongoing results of the research. How does the researcher respond to the research findings in the process of promoting the critical project? McGrath finds that

more recent approaches to critique emphasise the need for the practice of critique against an earlier preoccupation with the theory of critique. This shift comes to the fore in McGrath's preference for longitudinal ethnographic studies. The development of the critical traditions cannot only be based on theoretical perspectives, but it should also be informed by the practice of critique.

7.5. Researcher

Critical approaches have become increasingly aware of the problematical role of the researcher. The critical researcher is in many ways placed in a position of power because of his/her access to critical social theories through which the ills of society could be identified. In contrast to the interpretive researcher, the critical researcher knows better than the people under investigation because they may have a false consciousness about the real underlying causes of their oppression.

The authority and expertise of the researcher may be in conflict with the ability and need of people to bring themselves the desired transformation about. A central dilemma for the critical researcher is when the dominated do not seem to want emancipation. Is the researcher justified in labelling this hesitance as false consciousness? At what stage could it be said that the researcher imposes his/her values and ideas on others? Wilson (1997) finds, for example, the role of the facilitator in ISD (as explained by Hirschheim & Klein, 1994) problematic since the power of the facilitator remains hidden. He asks how emancipatory methodology will be used to overcome what Hirschheim & Klein (1994:88) call the "wilful unresponsiveness by an individual". There seems to be a conflict between the role of the researcher and the values of autonomy and democracy.

Because of the problematical role of the researcher, it has become important to become reflectively aware of his/her own role in the research process. It is for McGrath (2005) an important requirement of the researcher to continually reflect on and respond to the research findings in order to be aware of how the researcher is changed by the research process. The postmodern critical researcher is more cautious about the possibility of transformation because of the ambiguous nature of power. The possibility exists that the best intentional critical and transformative research may contribute to new forms of domination.

7.6. Method

The methods of critical interpretive and of postmodern research differ in important ways. Interpretive and critical approaches are seen to be mutually exclusive: the more interpretive you work, the less critical you are and vice versa. A clear line seems to separate these two: when interpretation begins to address underlying structural dimensions or employ critical categories such as race, class or gender, it stops being interpretive and becomes critical. The strong use of these categories tends to distort what needs to be described.

The relation between the interpretive and the critical is defined by Alvesson & Deetz (1996) in their well known description of the three elements of critique: insight, critique and transformation. Richardson & Howcroft (2006:145) summarize the main aspects as follows. Insight helps to highlight hidden or less obvious aspects of social reality in the process of seeing how various forms of knowledge, objects and events are formed and sustained. Critique challenges many of the taken-for-granted assumptions, beliefs, ideologies, discourses that permeate IS phenomena.

Transformative redefinition is the development of “critical, relevant knowledge and practical understanding to facilitate emancipatory change”. This distinction confirms the separation between interpretation and critique and regards interpretation as a precondition for critique.

The basic difference between these approaches is indicated by Alvesson & Deetz (2000) as follows. It seems to claim that there are three separate processes operating independently of each other.

Critical research may have different emphases; interpretive work aiming for insight may be central, complemented by limited elements of critique and transformative re-definitions. Critique may also dominate, but if so the empirical case study is typically used for more limited, illustrative purposes. Transformative redefinition should not dominate empirical research. Texts dominated by this tend to be Utopian and this quality is not salient in studies with research ambitions. (Alvesson & Deetz, 2000:153)

The ability of interpretive research to be critical is questioned because of its explicit aims to interpret and not to cast judgement on the situation. It is also a question whether interpretive research with critical intent, is still true to the basic elements of interpretivism. In order to be critical, CT finds it necessary to employ theories or

values that transcend the situation and from where critique could be rendered. According to this people within the situation are in important ways unable to gain their own insight into the social contradictions and their own roles. This kind of critique is severely questioned in postmodern thinking because of the way in which the validity of these values and theories is taken for granted. From the postmodern perspective, the critique of CT is nothing more than the bias of a particular group that obtained the status of universality.

The critique from poststructuralist and postmodern perspectives leads to deeper reflexivity among critical researchers. McGrath (2005:92) states for example:

The issues for critical research are those concerned with how research conduct is a response to the unfolding pattern of research findings; the way that researchers and their subjects are changed in the process; and how researchers achieve critical distance. The first two issues are those that Klein & Myers (1999) found to be largely ignored in the interpretive studies they examined.

Reflexivity aims to make researchers aware of the way they may be implicated in the research and that they are not necessarily the emancipators. McGrath (2005:91) shows that Foucault attempts to overcome the divide between hermeneutics and structuralism. It was possible for Foucault to make a pragmatic reading of the situation. He could provide critique without resorting to “an essential theory of human nature”. In a similar fashion McGrath (2005:92) wants an approach that goes beyond interpretivism and the critical uncovering of deeper meanings within the context.

While such contextualization and suspicion may be seen as defining traits of a critical researcher, I suggest that, at some point, a critical researcher must break out of the hermeneutics of suspicion to problematize the observed behaviours. In the Foucauldian spirit ... they must find a way to present an account that neither relies solely on what the research subjects say, nor expects to unearth ‘a different and deeper meaning of which the social actors are only dimly aware’.

Rather, I argue that dealing with a combination of hermeneutic and structuralist issues are an important and non-trivial task for critical researchers, in which I include interpretive researchers with critical intent. Moreover, I focus on longitudinal studies and ethnographies, not only because these tend to be critical researchers’ methods of choice ... but also because they are a way of conducting interpretive research ... which may produce elements of critique.

7.7. *Pluralism in the field of ISR*

Two kinds of pluralism could be identified in ISR: a paradigmatic pluralism of the field as a whole, and a pluralism of critical approaches. Both these kinds of pluralism are important for the continued reflection of the nature and possibility of critique.

In relation to paradigmatic plurality, the field of ISR is described as a “fragmented adhococracy” by Banville & Landry (1989). Different paradigmatic approaches are also mapped by Hirschheim & Klein (1989) on the basis of Habermas’ theory of knowledge-constitutive interests. Hirschheim, Klein & Lyytinen (1996) provide a theoretical base for this pluralistic nature of the field on the basis of the social action theory of Habermas and a conception of hierarchical ontology of Etzioni. Klein & Hirschheim (2008) use the notion of knowledge communities of practice to show how various communities exist within each of the research paradigms (positivist, interpretive and critical). They refer to the field of ISR as having a “multi-level community structure”.

In these categorisations, a “critical paradigm” is identified as separate from the positivistic and interpretivistic paradigms. A problem with the categorisations of the field of CRIS is the way they see the relation between the different “paradigms”. The division of the field between different paradigms suggests a level of isolation. Although Hirschheim, Klein & Lyytinen (1996) have argued for closer interaction between the different research approaches, a separation persists between the research of technologies and of human interaction. The result of this separation is that the way technologies impact on human action could not come clearly into focus. The critical paradigm only applies to human action and does not extend to technology as such. It could therefore be argued that the paradigmatic division of the field leads towards a limited view of critique.

The critical paradigm could be located within the field in different ways. On the one hand, it is seen as an alternative to positivistic or interpretive research and on the other hand as complementary. While Chen and Hirschheim (2004) are in favour of pluralism in the IS field where critical and non-critical approaches could operate together, for Brooke (2002d:273) paradigm incommensurability “remains an important plan in the radical theory project”. Richardson & Robinson (2007:263) are of the opinion that “pluralism carries with it the danger of co-option” and critical

research becomes merely one approach among others to choose from. They emphasise, in contrast to Chen & Hirschheim (2004), the antagonistic nature of critical research which cannot coexist peacefully with mainstream, positivist research.

Rather CISR [critical information systems research] researchers are an irritant, questioning that which could be taken for granted, challenging that regarded as 'commonsense', contesting hyped views of the development of ubiquitous computing in whatever shape or form, having the role of historical memory, reminding the IS field of that which has led so often to fads, fashions and failures in practice. (Richardson & Robinson, 2007:264)

They conclude that critical research in IS has become more visible although it would never be a dominant trend. It is for them important that critical research establishes itself as "an alternative to the dominant approach" (Richardson & Robinson, 2007:265). Critical research should establish its own agenda and its own distinctive voice in separation of and opposition to mainstream research.

In both cases a clear distinction is made between critical and "mainstream" approaches to research. The suggestion is that positivist and interpretive research can, by definition, not be critical and that they support the status quo. It remains a question, however, whether the research approaches could be distinguished in such a clear way and whether it could not be argued that positivist or interpretive research may have important critical implications regardless of the intentions of the researcher.

7.8. *Pluralism in the field of CRIS*

As far as pluralism within critical approaches go, the discussion so far has indicated how a single focus on Habermas has made way for various other theoretical positions which inform critique Brooke (2002b and d). This opens the question of the identity of critical research and the question about the relation between the different critical approaches. Should the different critical approaches be seen as mutually exclusive, as complementary or as incommensurable (Mingers, 2001)? In the latter case the critical approaches are used in an eclectic way. Can one speak of a single paradigm of critique as described in the initial overview of Hirschheim & Klein (1989, 1994), or is critique a multiparadigm enterprise, drawing on critical theory, interpretivism, and postmodernism?

The variety of critical approaches is seen by some as a weakness because they fragment the terrain and do not provide a coherent alternative to “mainstream” research. Klein & Hirschheim (2008) find that “even the relatively small paradigmatic community of critical researchers is characterized by confusion among several major theoretical perspectives”. Various voices were raised for more coherence or methodological agreement (McGrath, 2005).

Others (see Brooke, 2002a) have started to celebrate the plurality as the strength of critical approaches. McGrath (2005:89), for example, favours an eclectic approach:

In a transformed but still divided world, eclectic views of criticality seem better able to address the key role of context in framing what is considered rational and desirable (Avgerou & Madon, 2004) and to account for the grossly uneven processes of IS innovation in a global context (Walsham, 2001; Avgerou, 2002).

This preference for eclecticism concedes that the different approaches do not have to be commensurable as long as there is a common commitment to a form of emancipation and transformation.

In a similar way, Saren & Brownlie (1999) want to define critique broadly:

By critical perspectives we mean modes of theorising and research practices which regard knowledge and its related technologies as socially constructed and enacted; which take those practices to be historically and culturally contingent; and which are understood to shape and be shaped by vested interests and power. By critical theory we mean any approach drawing inspiration from the substantive critical traditions of, for example, feminism, Marxism, ethnography and symbolism, poststructuralism, hermeneutics, postmodernism and environmentalism.

Brooke (2002d:273) summarizes the critical approaches of CT, postmodernism and Critical Realism as follows:

They represent three distinctive and contrasting approaches of critical IS research. CST [critical systems theory] and postmodern systems thinking occupy a middle ground between objectivity and subjectivity. Critical realism represents a more objective and rationalist route to critical research whereas critical post-modernism offers a more relativist approach.

In spite of her appreciation for Foucault, Brooke (2002b:54) wants to see that approaches based on Habermas and Foucault operate in a complementary way. She refers to a “dialectical dance” of the two theorists in which the central claims of

each are maintained and where one is not taken over by the other. It would also be important to explain the meaning of emancipation within which power is fully accounted for.

For Brooke (2002b) all the critical approaches belong together because they all ask critical questions. For her critical approaches have broadened to become

a broad church that extends beyond traditional forms of critical theory. Consequently, we need a broader definition of what it means to be 'critical' (Alvesson and Deetz, 2000). If all this should sound daunting, even inconsistent, Alvesson and Willmott (1992, p.3) draw attention to the fact that critical theory has always encouraged the creative borrowing of ideas from different schools of theory and practice. The common thread is usually the emancipatory interest rather than the detailed following of any one particular theorist. (Brooke, 2002b:50)

The diversity of critical approaches testifies to the complexity of critique. This seems to be needed because of the complexity of the social worlds that are the objects of critique, the ambiguous way in which power operates and a non-essentialistic notion of emancipation. A single enemy cannot be clearly defined any more and a clear transition from oppression to emancipation does not exist. It could be argued that this complexity is better approached through a variety of theoretical perspectives. The value of a critical perspective is not necessarily a function of a critical intention or a critical theory, but should be established in relation to the perspectives it brings and the effects it has. The pluralism does not have to be seen as confusion or a weakness, but the acknowledgement for other approaches to critique is a realisation of the complexity of the issues involved and the inability to provide an adequate account of critique from one position.

8. Conclusion

In this chapter an account was given of critical research in ISR. The purpose was to gain an understanding of the meanings of critique. It showed that critique has developed from its roots in Marx and the Frankfurt School via Habermas to the diversification of theoretical positions under the influence of postmodernism and poststructuralism.

This analysis has shown that the critical tradition has become more complex. This complexity reflects the complexity of any social or socio-technical context (such as

an organisation or an information system). It also testifies to the multiple forms of power, domination and exclusion that are present in these contexts. It appears appropriate for critique to reflect the same kind of complexity which characterises human nature, practices and institutions. The plurality of critical approaches could be seen as an outcome of the realisation of the complexity of practices and institutions, of the unpredictable and ubiquitous ways in which power functions to produce truth and practices. It contributes to the need for critical social theory to become more sophisticated by realising that the dangers do not come from one source.

Oppression is not simply the effect of a centred location of dominant power.

Emancipation is not a once-off achievement because the liberated quickly turns against others. Power and control are not located at a centre, but it is diffused within social contexts and could simultaneously liberate and dominate. Resistance cannot be based on a unitary conception of the self. Any attempt to capture the complexity through a set of categories/classifications immediately reduces it.

What became clear from this overview of critical approaches in IS is that technology itself is not clearly theorised. It is also clear from this analysis that technology is not well conceptualised. It is not clear what difference the presence of technology makes in the critical analyses. This issue is taken up in the next chapter which argues that the lack of theorising about technology proves to be a major limitation in critical approaches. Although these approaches have become more complex and nuanced, their failure to fully incorporate technology in their theorising prevents a more complete form of critique.

Conceptions of technology in CRIS

1. Introduction

The account of critical approaches in ISR in the previous chapter indicates that critique becomes theoretically more complex since it draws on more than one critical tradition. The call for empirical investigations adds another dimension to this complexity. It has been suggested, though, that the critical approaches to IT does not yet take technology seriously enough. Technology itself is seldom adequately theorised and taken into account to describe the nature and functioning of critique. Conceptions of technology should answer the question about the nature of technology and the relationship between the social and the technical. This relation is particularly important for critical approaches interested in the effects of power in human interactions and the possible roles played by technology.

This general lack of conceptions and theories of technology is widely acknowledged in the IS literature (Orlikowski & Iacona, 2001; Sawyer & Chen, 2002; Sawyer & Crowston, 2004; Hanseth *et al.*, 2004:117; Orlikowski & Scott, 2008). In their analysis of 2027 articles in the leading journals in the field of management and organisations, Orlikowski & Scott (2008:3) found that only 4.9% deals with technology as such. Orlikowski and Iacona (2001) investigated articles published in *Information Systems Research* over a 10-year period to establish the conceptions of

technology. They found that the IT artefact is in general very poorly theorised even though it is the core concept in IS. The IT artefact is not problematised, but largely seen as “stable, discreet, independent and fixed” (*ibid.*, p.121). They distinguished the following four conceptions of technology: technology as tool, as proxy, as an ensemble and as computational. In most cases IT is seen as a tool (25% of articles) which is engineered for particularly well-defined functions and purposes such as increased productivity, the substitution of labour, information processing and to develop social relations. In all these cases IT is a mere means for the achievement of predefined purposes. The “proxy” view entails that a certain element is taken to represent IT as such. IT is then equated with the way it is perceived by people, or its use is equated with the extent to which people accepted it or with the extent to which it is diffused in a particular context. It could also be equated with the capital investment. The “ensemble” view of IT is only present in 12% of the articles and refers to the “dynamic interactions between people and technology” (*ibid.*, p.126) where technology is enmeshed in its use. The authors classify in this category Orlikowski’s own work based on Giddens’ structuration theory. The “computational” view of technology focuses on technology as algorithm and on the modelling function of IT. They found that in 25% of the articles a “nominal” view of technology is present which means that technology is merely mentioned and not conceptualised in any explicit way. They conclude from this survey that the technological artefact is not adequately theorised in the IS literature.

In a similar way, Sawyer & Crowston (2004) investigated the IFIP 8.2 literature for the period 1984 - 2000 and found that 55% of the articles present technology in terms of a proxy and a nominal view. They report that the rest of the articles present technology in either a feature - or a functional view. The former relates to the intentions of designers that are built into the technology and the latter to the ways in which IT is used. It is, however, not clear how these two perspectives relate to each other, how the way technology is designed relates to the ways in which it is used (Sawyer & Crowston, 2004).

The conclusions from these overviews that the technological artefact did not receive adequate attention, apply also in a general way to the lack of theorisation of technology in the critical literature. This theoretical gap led to the well-known appeal of Monteiro & Hanseth (1996) that researchers should be more precise about

technology and of the request of Orlikowski & Iacona (2001) for the theorising of the technological artefact.

One of the important areas of this theorisation is the relation between the social and the technical, more specific, the notion of agency. The concept agency indicates who/what is responsible for a certain effect or to whom/what a certain effect could be traced back. The issue remains important even though the attribution of agency to a particular entity is not a simple process in the light of the unacknowledged conditions and unintended consequences of action (Giddens, 1984). A central question in the conceptions of technology is whether agency should only be attributed to humans or whether one could also talk of machine agency. The underlying questions about the meaning of agency and whether the term should be reserved for humans remain. If agency is exclusively allocated to either of the two, how do they impact on the other? If agency is attributed to both, which one is the dominant agent or should one rather talk about a balance of agencies? A typical example of such a notion of machine agency appears in the following statement by Orlikowski & Baroudi (1991:17):

Orlikowski found that the deployment of CASE tools had significant implications for the division of labor and relations of dependency among the project team members. In particular, she found that the use of information technology "triggered structural changes within the project teams, which institutionalized the existing, formalized fragmentation into technical and functional groupings" and that such technological change "undermines the homogeneity of the [firm's] 'team' ideology by breeding subcultures and territorialism . . . [resulting] in tension and conflict on project teams.

We find here a description of a strong agent which has certain effects and which brings about certain changes. Statements such as these appear regularly in the critical literature, but are not accompanied by an explicit account of the kind of agency technology exercises or the relation with other kinds of agents.

This debate hinges on the understanding of the concept agency. The origin of the concept lies in humanistic and critical traditions and is associated with typical human qualities such as emotions, intentions, purposes, choices and autonomy. It is therefore understandable that theorists would strongly react against the use of the concept to describe material objects and would at most see this association as metaphorical. Many authors (such as Vandenberghe, 2002) react very strongly against any notion of material agency because it represents an inappropriate

intrusion from the material into the human terrain. The issue is not so much whether humans and material are different, but whether these differences could be understood in essentialist and *a priori* ways. But, however this issue is to be resolved and if the concept of agency is to be exclusively reserved for humans, there is a need to develop the language to describe and analyse the effects of technology. Many authors, as in the quotation above, acknowledge these powerful effects and the inability to describe a kind of technological agency prevents one from analysing these effects.

This lack in the theorisation of technology, through which the language for description and analysis should be developed, prevents researchers in general and critical researchers in particular from understanding more accurately the roles and effects of technology and the relation between the technological and the social. Since conceptions of critique are closely related to conceptions of technology (Orlikowski, 2005:183), further theorisation of technology would broaden and deepen the critique. A limited form of critique, based on a limited conception of technology is, for example, present in most of the critical management literature. Technology is mainly seen here as a neutral black box used by managers to achieve their predefined purposes. If the dominating effect of this use of technology is the intensification of work, enhanced surveillance and the more efficient management of workers, one should only look critically at the intentions behind the way managers use technology for their own purposes. This particular conception of technology would prevent critique from looking any further in order to establish whether the technology itself does not also play a role in these processes on the basis of its design features. Orlikowski & Scott (2008:40) conclude their survey by saying that

we believe that to the extent that the management literature continues to overlook the ways in which organizing is critically bound up with material forms and spaces, our understanding of organizational forms of life will remain limited at best, and misleading at worst.

If technology is conceptualised in an instrumentalist way, then the critique of technology would focus on the agents surrounding it. If, on the other hand, technology is conceptualised in a substantial way, then critique should uncover the inherent features and functioning of technology since one cannot critique technology without insight into the nature and functioning of technology itself. It makes a big difference to the way in which the critique of technology is approached if technology

is seen as a monster or as an obedient servant. In the first case it must be decomposed and in the second its master must be scrutinised.

Although information systems are sometimes seen as either purely technical or purely human, at least in the context of critical perspectives they are seen to consist of technical and human elements. The question is, however, how these elements are defined and how they relate to each other. Although a conception of technological agency is implicit in many critical approaches, the nature and functioning of this agency is not adequately theorised but mainly seen in constructivist or instrumentalist ways. If technology is seen in these ways, it becomes a mere product of the social where it is constructed according to social beliefs and used for social purposes. The critique of technology can therefore not be distinguished from the critique of the social. The most technology could do is to either reinforce and entrench already existing social meanings and practices or to determine social conditions on the basis of its inherent features. It then becomes difficult to distinguish critical IS from critical Management Studies, or critical Organisational Studies. If the technological artefact is not clearly defined and its distinctive role understood, a broader and deeper form of critique of technology is not possible.

Orlikowski (2005:183) states that conceptualisations of technology swing continuously from the privileging of the technological to the privileging of the social with the middle ground taken up by socio-technical and emergent approaches. Conceptions of technology could, according to Orlikowski & Scott (2008), be divided in two positions, the substantive technological and the socio-technical. The main issue is whether technology has an “essence” of its own which affects the social, or whether the technological is a malleable product of the social. This chapter discusses some of these conceptualisations of technology ranging from a substantive view which portrays technology as an entity that functions according to an internal logic; to instrumentalist views which see technology as a mere tool in human hands. More sophisticated are socio-technical views which recognise the close relationship between the social and the technical. The socio-technical views range from social constructivist views, to views which recognise the duality of the social-technical relationship to a more insistent dualism which separates the two terrains. It will be indicated in each case how the critique of technology is understood. These accounts testify to a generally weak theorisation of technology as

such and of how it functions in IS. It does not allow one to see the multiple ways in which IS is shaped and changed, and how it impacts in unpredictable and unintentional ways on the socio-technical system as a whole.

The rest of this chapter provides an analysis of different conceptions of technology by drawing on the categories defined by Orlikowski & Iacona (2001). It uses, in a selective way, illustration material from the critical perspectives in order to show how these conceptions of technology are present in the literature. It could be agreed with Jones (1999:290) that the extreme positions of technological and social determinism are not occupied by any theorist and that more qualified positions exist. He discusses approaches that emphasise strong technological agency (Mumford, 1995) and those that emphasise social agency (Mackenzie & Wajcman, 1998; Pinch & Bijker, 1987). Although some of the categories such as technological determinism are not present in a strong form in the literature, they are used to depict extreme positions in the process of mapping out of the terrain. While some of the conceptions described here relate to ANT, a systematic account of the ANT perspective on technology is done in the next chapter.

2. Instrumentalism

According to the analysis of Orlikowski & Iacona (2001), the instrumental view of technology is the most prevalent in the IS literature. It is the view that technology functions as a neutral but essential tool to achieve fairly well predefined purposes. It differs from substantivist or constructivist views since technology itself is neither good, nor bad, but neutral. There are not meanings or values embedded in technology as claimed by social constructivists or a fixed nature as claimed in substantive views, or interplay between the social and the technical as in socio-technical views. Technology is a tool, such as a hammer, which could be used for a particular purpose, such as hammering a nail. Technology is flexible in the sense that the same technology could be used for different purposes. A direct link can be made between the intentions of the users of technology and the outcomes.

Technology is the intermediary which enables the user to achieve a purpose.

It is significant that this view is so dominant in the IT literature because it reflects an unawareness of the possible effects of technology seen as a neutral tool.

3. Substantivism

Substantive views attribute a particular nature, or “essence” to technology which determines how it always functions. Although technology is the product of human actions and designs, it is not controlled by humans. It has a nature of its own, operates according to an inherent logic and determines its own goals. In optimistic versions of this view technology is seen as a benign force which, once released, would ensure a better life in terms of progress, equality and prosperity. In pessimistic versions technology is seen as alienating and oppressive.

A substantive view of technology is presented by Heidegger. In *The Question Concerning Technology* (1977), he portrays technology as an autonomous and substantive entity which forces everything else, including nature and humans, to become a resource for itself. The classical example of this is the way the hydro-electric plant in the Rhine treats the river as a resource from where power is extracted and used for other purposes (Heidegger, 1977:16). Pessimistic views which see technology in a substantive way are presented by Postman (1993) and Ellul (1964). Postman (1993:28) states, for example that in

a technocracy, tools play a central role in the thought-world of the culture. Everything must give way, in some degree, to their development. The social and symbolic worlds become increasingly subject to the requirements of that development. Tools are not integrated into the culture; they attack the culture.

Winner (1986) reports on various views where some forms of technology are seen to favour either democratic or authoritarian organisations of society. He makes a critical comparison between Engels’ and Marx’s views of technology. According to Engels authoritarianism is a necessary part of technology

If the basic case is as compelling as Engels believed it to be, one would expect that as a society adopted increasingly complicated technical systems as its material basis, the prospects for authoritarian ways of life would be greatly enhanced. (Winner, 1986)

It could be argued, on the other hand, that information technology implies a more open and democratic society. We find that Winner cannot choose between the constructivist and substantive views of technology. He states that the roles of some technologies are flexible while that of others, such as nuclear technology, are intractable. The latter necessarily imply an authoritarian arrangement in society.

Closer to ISR, examples of substantivism are present in Orlikowski and Iacona's (2001) description of the computational view of technology. This view of technology is based on an "individualistic ontology" which confirms the existence of well defined, discrete and separate entities. In their survey of the literature Orlikowski & Scott (2008:10, 11) refer to the ways in which fixed characteristics or properties are attributed to technology.

Substantive views are often accompanied by forms of determinism. While substantive views refer to the nature of technology as such, deterministic views refer to the way technology functions in relation with other entities. Once technology is introduced into a particular context, the nature of the processes and the outcomes are pre-determined. When substantive and deterministic views are combined, technology is seen as an extremely powerful force as presented by Postman (1993). A softer form of this is reported on by Jones (1999:290) who refers to various studies where technology is portrayed as effecting certain changes in organisations and society although he argues that none of these views portrays technology in a strictly deterministic way.

Within the context of critical research, elements of such a substantive and deterministic view of technology are present in the account of Hirschheim, Klein & Lyytinen (1996:15). They describe technology as operating according to the unchanging laws of nature such as the law of gravity. Its functioning cannot be stopped although it could be channelled. They claim that technology is subject to "hard natural laws" and fundamentally its change is most "constrained": we rule through technology by obeying and harnessing the laws of nature.

More recently, a similar substantive view of technology with anti-humanistic implications is presented by Kallinikos (2004:145-147) who describes modern information systems as a substantive entity with an inherent logic and with "abstract characteristics that transcend time and space". Kallinikos seems to present technology as self-moving agents who "now travel rapidly across the entire globe, reconfiguring important premises of local contexts" The reconfiguration also applies to humans. For Kallinikos humans in formal organisations could not invoke all their interests, values or feelings, but only selected aspects of themselves that have "an instrumental orientation, while suspending the invocation of all other

characteristics or their personality that do not bear upon the situation". It seems that Kallinikos does not only talk about formal organisations, but about any use of technology which selects the kind of human characteristics that are allowed.

Technology has a 'systemic' nature which includes "complex arrangements of items, steps, and operations that bear upon one another in ways that create a pattern of functional interdependencies and temporal sequences" (Kallinikos, 2004:147). The self-referentiality or black boxing of technology isolates it from environmental influences and enables it to effect and transform this environment. "The 'Geist' of contemporary technology is reflected in the dual strategy of functional simplification and closure by which technological systems select and define a domain of the real, and instrument the standardized and recurrent cause-effect, means-end sequences underlying them (*ibid.*, p.157). It is clear how Kallinikos draws explicitly on Heidegger's understanding of technology.

DeSanctis & Poole (1994) report on the view of the "decision-making school" about the role of technology in organisations. In one version of this view technology is seen in a deterministic role in relation to the organisation. The properties of technology have to be studied in order to determine exactly what influence it has. A hierarchical structure in an organisation is, for example, the direct result of such principles built into the technology. The authors contrast the decision-making view with the institutional view of technology which is related to the socio-technical and constructivist views of technology.

The problem with a view that allocates strong agency to technology is that the same technology does not always have the same effects in organisations (DeSanctis & Poole, 1994:124). In their overview of conceptions of technology in the management literature, Orlikowski & Scott (2008:10) indicate that the basic problem with a view that sees technology as a 'distinct' entity lies in the inability to make a direct link between the features of technology and organisational outcomes. From their extensive empirical research on technology in organisations they found a wide and diverging range of outcomes and effects associated with any particular technology. They see technology as either an independent or a dependent variable in organisations. They show that in both cases all the effects of technology could in principle be traced to its inherent features.

If this conception of technology is used as the basis of critique, it has to be realised that the nature and functioning of technology cannot be changed. If it is in the nature of technology to treat humans as resources, it would be the task of a critical approach to critically assess how this occurs. Critique also needs to find ways in which technology could be controlled to ensure that it serves the right purposes. It might mean that technology should be enhanced in some instances and contained in others. The most important critique against this view is presented by Orlikowski & Scott (2008) who questions a direct link between the features and effects of technology. If the effects of technology could not be traced to its features, how should we account for it?

4. Technicism

Whereas the substantive view sees technology as a well-defined entity which imposes its internal characteristics in the contexts where it is employed, the technical view limits the role of technology to a computational function. This view of technology is discussed with reference to views based on Habermas that sees the social and the technical in a dualistic way.

When the social and the technical are seen dualistically, they operate in two different and clearly distinct ways. Although they function often in the same terrain, they could be kept clearly distinct. This is present in the basic dualism in the critical views influenced by Habermas whose distinction between the system world and life world and his conceptualisation of technology is discussed in Chapter 2. The world of humans are clearly separated from the world of things as indicated by Ngwenyama & Lee (1997:151)

Moreover, CST, in contrast to the positivist perspective, posits that (1) there is a difference between observing nature and observing people and (2) inquiry into social activity should focus on understanding their meanings from within the social context and lifeworld of actors.

O'Donnell & Henrikson (2002:96) use Habermas' view to provide a conceptual map with which to analyse the positive and negative effects of technology on various aspects of the life world. This is necessary in the case of ICTs which operate in both system (of money and power) and life world (of culture, communicative action). In the system-world of the modern economy, ICTs contribute towards electronic

commerce and globalisation. It also functions as mediating devices between the systems and the life world. The role of technology could be evaluated as negative or positive on the basis of its influence on the communicative action within the life world. The impact of technology is negative when it colonizes elements of the life world and when its use leads to loss of social meaning, anomie, alienation, rupturing of traditions, or the unsettlement of collective identities. The impact of technology is positive when it contributes towards emancipation and human development measured against the operation of validity claims in this sphere. Technology must be carefully monitored to establish whether it contributes to the colonisation or the enhancement of the life world through the development of communicative action. The ambiguous role of technology is recognised within this tradition of critical theory. Technology could be, on the one hand, the product of technical rationality which separates it from the life world (Brooke, 2002b), but it can also play an enabling role in the life world. The dualism comes to the fore in the clear separation between the system world and the life world and the home of technology in the system world.

The sharp separation between the social and the technical in these views does not make it possible to understand how and why the technical impact on the social since it mainly focus on the effects of such a relation. Since meanings in the social terrain could only be established through human communicative interaction, technology cannot play any role. The role of technology in the social is positive if it effects more open and free communication. It is not possible to relate the design of technology to these particular effects. The functioning of technology in the life world remains of a technical nature and does not shape the communicative processes as such.

The way in which such a view of technology is articulated within critical traditions could be illustrated with reference to the analysis by Hirschheim, Klein & Lyytinen (1996) of the field of ISR. Hirschheim, Klein & Lyytinen (1996) provide a theoretical base for the view that ISD is a “fragmented adhocracy” (Banville & Landry, 1989) by designating ISD as a complex and pluralistic field of study on the basis of the various kinds of objects that comprise it. They attempt a coherent classification system that would map all the different research foci of the field. In this process they use conceptual frameworks of Habermas and Etzioni to distinguish between “action orientations” and “domains of change”. The orientations represent purposeful actions of the researchers and are classified as instrumental, strategic, communicative or

discursive. These orientations explain why a certain change is to be brought about and is based on the (human) actor's beliefs and assumption about the domain that must be changed. The domains of change are those things the actor wants to change and consist of technology, language and organisation. These two axes form a table (see below) with 12 cells which describe possible "object classes". Only nine of these object classes are possible areas of study since technology cannot be combined with the communicative and the discursive orientations. The table with object classes reflect different paradigmatic research approaches within the field of ISD and shows how the fragmented nature of the field could be presented in a coherent way. The existence of these research approaches shows how the field of ISD is fragmented and that unifying paradigm is not possible or desirable. It is therefore quite legitimate to engage in purely technical research in isolation from research interested in sense-making or argumentation. To see ISD as an adhococracy is to recognise the presence of alternative paradigms associated with the different object classes. The different domains also entail different ontologies, an ontology of the technological and an ontology of the human. The article presents an important argument in that it expands the understanding of the field of IS beyond the traditional and dominant focus on the design and use of technology to include human aspects of organisations. In this view Information systems are mainly seen as the outcome of human actions.

What is important in this account is the way in which humans and technology are defined and demarcated. The world is sharply divided into two domains, active human subjects which bring about change and passive objects/domains which are being changed. The changes are based on the human actor's beliefs and assumptions about the domain to be changed. This results in a strong sense of agency attributed to humans and instrumental power to technology.

Intellectual Structures of ISD:

| Domains | Orientations | | | |
|---------------------|--|--|--|---|
| | Control | | Sense-making | Argumentation |
| | Instrumental | Strategic | Communicative | Discursive |
| Technology | <i>Information Technology systems</i> Hardware and telecommunication configuration; Program structures and modules; Database and file structures | | | |
| Language | <i>Formalized Symbol Manipulation Systems</i> Data models and dictionaries; Data integrity mechanisms; Screen and form designs; Model management systems | <i>Manipulative Communication Systems</i> Definition of terms and rules; Communication channels; Access rights; Data integrity | <i>Symbolic Interaction systems</i> Speech acts; Intentions; Meanings; Metaphors | <i>Systems for rational argumentation</i> Arguments; Warrants; Breakdowns; Pragmatic inference |
| Organization | <i>Mechanistic social Systems</i> Tasks; Decision procedures Business processes; Organizational structures | <i>Political systems</i> Power structures; Resource dependencies; Interest groups; Sources of authority; Indirect influence; Negotiated orders | <i>Cultural Social systems</i> Values, beliefs; Myths, rituals; Negotiated meanings and practices | <i>Systems for Institutional Checks and Balances</i> Domination free discourse; Justification and minimization of power; Truth and justice; Due process |

Figure 1: Object system classes and examples of possible objects (Hirschheim, Klein & Lyytinen, 1996:17)

In their mapping of different orientations and domains in the field of ISD they identify the technical orientation as the only one applicable to technology. Technology therefore does not function under the strategic, discursive or communicative interests. The object class “technology” is placed in the technology/instrumental action cell, and in the technology/strategic action cell of the table and is therefore only associated with the interest of efficiency and control. In line with the Habermasian view of the domain of the technical interest related to nature, this object class is defined as follows:

For example, all technology is composed of physical artifacts, it follows the laws of nature and exhibits deterministic behavior. Overall, we can see that technology is subject to "hard natural laws" and fundamentally its change is most "constrained": we rule through technology by obeying and harnessing the laws of nature. (Hirschheim, Klein & Lyytinen, 1996:14, 15)

Technology is seen in a deterministic way as reflecting natural laws and as totally different from humans who also operate in the strategic, communicative and

discursive interests. These orientations require human traits which by definition are not part of the technology domain. By limiting technology to physical artefacts and the necessity of natural laws, it is excluded from the domains of language and meaning-making. The implication is that the operation of language protocols, for example, is part of the domain of technology.

Although the authors strongly emphasise human agency, technology has, in an instrumental sense, powerful effects:

In the context of information systems, technology covers the physical means and technical know-how by which information processing tasks are accomplished. Included are hardware and software which provide the means for better storage, processing and transmission of symbols. Whereas new technology is often the driving force in IS change, its effects go far beyond the removing of some old machines and putting new ones in their place. Instead, IS change is by many seen to be more similar to changing the whole transportation system (e.g. from railways to cars), because it affects the institutional arrangements, social practices and the distribution of power. (Hirschheim, Klein & Lyytinen, 1996:14,15)

Even though technology has these powerful effects on the system, it does not mean that any sense of agency could be attributed to technology because humans still “rule technology”. The instrumental action associated with technology is concerned with the achieving of given ends (that have been socially predefined), and treats everything in the domain as controllable objects (*ibid.*, p.10). While humans control technology in an instrumental sense, the control could also extend over humans who then become controllable objects.

When investigating the other domains (such as organisation and language), technology as such does not have a role to play. Its powerful effects, as indicated in the quotation, are not the result of technology as such, but of the way it is mediated through strategic, discursive and communicative actions. Technology does not have a direct effect on the other domains, whatever designs features it may have.

Questions that cannot be answered in this scheme are the effects of a particular technical design on the processes of sense-making or argumentation, or the effects of language protocols on the meaning in language. Since technology is relegated to the rule of the “functionalist toolkit”, it cannot as such be the object of critical inquiry. Emancipatory design only deals with guidelines and procedures dealing with democratic interaction between people. While the distinction of different object

classes provides a way to understand the focus on a particular aspect of ISD, the question concerning technology asks about the ways in which technology affects other object classes.

According to the schema it is possible to form a research community that focuses only on technology without an interest in any of the other orientations or domains, or to focus on (human) discursiveness and argumentation without attention to the underlying technology. It is a question whether such research foci are possible in the sense that they focus exclusively on one terrain denying possible impact on other terrains, or denying decisions that are taken about the other terrains. It could be indicated, for example, that the way a database is structured determines what kind of information will be made available for the “systems of rational argumentation”.

Another problematic issue is the conceptualisation of technology as only a material object. Standards and protocols are seen by the authors as part of language and therefore part of the discursive terrain. These protocols are, however, dependent on what could be translated into machine language. It seems then that the separation of the social and the technical is too sharp if the way software is built into the hardware is taken into account. This seems like an unlikely consequence since the way data is stored has an effect on the language protocols. The physical technology contains implicit meanings and arguments. It does not seem that the possible effects of technology on the other domains are clearly visible in this scheme because some of the effects of technology may not be mediated by human actions. While they recognise the strong effects of technology, the “voice” of technology is excluded from the terrains of meaning-making and argumentation. It is therefore not possible to hear what effects technology has on these terrains.

If these effects in the quotation above are attributed to technology, it is not clear how technology could be limited to the orientation of control. If technology affects the ways in which power is distributed, it also has an effect on the way meaning is made and arguments conducted. By making such a sharp distinction between the human and the technical, it is not possible to analyse exactly how the technical affects the social. The separation in object classes does not make this kind of investigation possible.

In this scheme, critique of ISD focuses on the social aspects and leaves the technological intact. In true Habermasian fashion, critique belongs to the terrain of argumentation. The conception of technology underlying this kind of critique does not provide the analytical tools to show how argumentation is already influenced (constrained or enabled) by technological designs. Technology itself is outside the scope of critique since research into the purely technical operates with a different ontology. Traditionally critique focuses on the social (human) terrain, and in the Habermasian scheme it deals with the emancipatory interests. As such critique of technology is not possible because critique could only be addressed against human actions. Since the authors accept the powerful effects of technology a critical view of technology should trace these effects. In which ways do the design of hardware and software already structure the processes of sense-making and argumentation? Certain views of sense-making and argumentation are already present in the way technology is designed. For example decisions are made about issues such as effective data management, accessibility, etc.

To see the field of information system development as a fragmented adhocracy prevents one from relating research in one area to research in the next. These relations are essential if the intermingling of the technical and social are recognised. It will be argued that these relations are important for a critical perspective on information systems. In their distinction of domains of research and of research orientations, the domain of the technological relates to the orientation of instrumental control.

This location of the technological deprives it of a critical scrutiny because critique is only possible in relation to the social elements of an IS. Although technology may have effects on other domains and orientations, these effects must be studied from a social perspective. The critical approaches see technology largely as a social construction. This implies that, as far as critique goes, only the social aspects of the IS should be focused on. The analytical tools are not being developed to critically analyse technology. Technology is technical, operates in the system world, intrudes into the life world or is mediated through human actions.

5. Constructivism

Where substantive views attribute a relatively fixed essence to technology and tend towards technological determinism, forms of social determinism is present in social constructivist views of technology. In these views technology is determined by the social context consisting of groups with particular interests and beliefs. Although a clear distinction is made between the technological and the social as explained in the previous chapter (critical interpretivism), the technical is seen as a product of the social. In this sense constructivism overcomes the dualistic views.

A distinction can be made between a constructivism of design and of use. In the first case technology is embedded with the interests, values and beliefs of a particular community and fulfils its designated functions. It is not only a neutral tool through which predefined purposes are achieved, but it also favours those purposes through the way it is designed. Technology is inherently biased towards purposes of the designers and when used also effects those purposes. As a reflection of the social purposes for which it is designed, it would extend and intensify interests such as control and domination when in the hands of a dominant group. Feenberg (2002:15) describes the “technical codes” which are “invisibly sediment values and interests in rules and procedures, devices and artifacts that routinize the pursuit of power and advantage by dominant hegemony”. The notion of the technical code indicates that what appears to be purely technical is actually the product of a code in which the social and technical are brought together seamlessly. It hides in a sense the role of values in technological design and therefore also implicitly opportunities available for the participation of agents in the (re)shaping of technology.

Pinch & Bijker (1987:29) introduce the phrase “interpretive flexibility” to describe how the development of technology is related to the interests of different groups and why some variants in the development ‘die’ while other ‘survive’ (*ibid.*). They relate different designs of bicycles to particular groups such as women and young men and show how these interests relate to particular design features. It is important in this analysis to clearly identify the social groups when, for example, the interests of the group “young men with nerves” could be related to the “high wheel Ordinary” (Pinch & Bijker, 1987:34). They also show that the stabilisation of technology is not a

technical process, but one where a compromise is reached between different interests or where the interests of one group dominate.

Once designed technology could function in a substantive and deterministic way if it imposes its embedded values and processes in the context where it is used. When constructivism is combined with determinism it suggests that technology could only be used in accordance with its inherent embedded nature. It then imposes its embedded practices, intentions, purposes and values within the context where it is employed. When constructivist views of technology are combined with substantive and deterministic views, it would mean that, having social meanings embedded within it, technology reproduces those meanings when used. This understanding of a constructivist view is close to the substantive views of technology. It becomes substantive when the design process disappears from the view and technology is experienced as a “black box”. In this case the critique of technology requires opening the ‘black box’ of IT and scrutinizing the power relations inscribed within it that may repress or constrain.

The second kind of constructivism refers to the ways it receives its meaning from the social context within which it is used. This is a second meaning of the term “interpretive flexibility”. Pinch & Bijker (1987:40) describe the malleability of technology in relation to social contexts by describing how different social groups have radically different interpretations of a particular technology. Since the construction of meaning determines how technology is used, the same technology could be interpreted and used differently in different contexts. Technology does not have an essential function or nature, but achieves its function within a particular context. Technology could therefore be changed if different meanings were attached to it. Regardless of the features embedded in technology or the intentions of the designers, it could be used in many different ways and for many different purposes. This view is present in Orlikowski’s (2000) distinction between the technological artefact and technology-in-use as discussed below. The inherent features of technology, as present in the artefact, do not have any influence on how technology is used.

Elements of this kind of constructivism are present in Computer Supported Cooperative Work (CSCW) which favours, for example, the explicit use of “boundary

objects". These objects are purposefully designed to be ambiguous in order to allow users in different contexts to share them and to simultaneously attach different meanings to them (Bowers, 1994:295). The constructivism of technology in use is illustrated by Doolin (2004) who argues that the focus is not so much on the role played by IT, but on the contexts within which it functions. He shows how an information system in a hospital becomes a contested terrain between hospital administration and doctors about the accountability of the latter group. The technology promotes initially the values and interests reflected in management discourse, but were later relegated to a less significant role due to the resistance of doctors. This study shows for Doolin that technology is both a condition and a consequence of power relations in organizations and society.

The two strands of constructivism are present in the research agenda Orlikowski & Iacona (2001:131) proposed for IFIP for the following 25 years. The agenda entails theorisation of technology and of the relation between the technological and the social. As part of the research agenda they propose the following: a) IT artefacts should not be seen as natural and given, but as designed, reflecting the interests of people; b) IT artefacts, embedded in a particular context reflect particular characteristics; c) IT artefacts are made up of a multiplicity of fragile and fragmentary components; d) IT artefacts are not fixed or independent, but emerge from social and economic practices; e) IT artefacts are dynamic and their stability is conditional. It is clear that Orlikowski & Iacona still operate within a basic humanistic framework with the result that it is not possible for them to allocate an active role to technology in an explicit way. Although they provide a more complex account of the relation between the technical and the social, it is not yet clear exactly how technology functions in the ensemble. The dynamics of the ensemble is not yet theorised.

Hirschheim and Klein (1994) focus more on information system development than on an analysis of technology as such. We find in their view the typical humanist separation of the social and the technical. In their account of ETHICS they explain that the two terrains of the social and the technical are developed separately when they state that "[B]ecause technical and social design criteria and alternatives are explored separately, it is easy to strengthen this part of ETHICS by using the functionalist tool kit for the realization of technical design objectives". They are aware

of the tensions between the technical and the social but believe that democratic methods could overcome it.

ETHICS is able to accommodate a broad range of efficiency and effectiveness criteria because it is in part founded on a functionalist frame of reference. It seeks to support the four key organizational functions defined by Parsons and Shils (1951): (1) objective-setting and attainment, (2) adaptation, (3) integration, and (4) stabilization (what Talcott Parsons called "pattern maintenance"). This is not inconsistent with neohumanist concerns as long as the continuation of existing patterns and goals is not used as an excuse to prevent fundamental change. (Hirschheim & Klein, 1994)

They are aware that a methodology of system design does not determine its own outcomes because it is embedded in a complex social context with the result that the same methodology could result in very different outcomes. They accept a basically constructivist view of technology because the process of IS design must be fully inclusive and participative. This provides the conditions for a design that enables free and equal communicative action. It differs from the earlier attempts of participative design in the sense that a much more comprehensive account is provided of the conditions for and impediments to the communicative processes.

The critique of the second strand of constructivism does not focus on opening the black box, but in analysing the social context which gives meaning to technology. The critique of technology does nothing different from what the critique of the social does. For this reason very little difference exists between critical management studies and critical research of information systems. The critique of information systems is implicitly a critique of the management structure of the organisation. What is new in relation to transformation is the role of technology to enhance communication and decision-making.

Constructivism generally fails to theorise the technological artefact and are not able to develop a critique of technology as such. Such a critique of constructivist approaches is rendered by Kallinikos (2004) and Rose *et al.* (2005a:147) on the basis that it does not provide the conceptual tools to analyse technology.

6. Socio-technical views

Whereas the substantive views attribute a relatively fixed essence to technology which functions according to an inherent logic, and the constructivist views emphasise the priority of human agency in the design and use of technology, socio-technical views recognise the interaction between and the mutual shaping of the social and the technical. The radical humanism of constructivism now makes place for a tempered humanism in which some kind of role is allocated to technology. Whereas it accepts the constructivist social shaping of technology, it also recognises that humans are affected by technology. They see the social and the technical largely as clearly distinguished separate entities that stand in some kind of relation with each other. Although different nuances exist about the ways this relationship is seen, the tendency is to allocate priority to human agency. The views range from exclusive allocation to human agency to views that recognise a notion of technological agency.

6.1. *Socio-technical duality: Structuration theory*

Whereas socio-technical dualism sees the social and technical as clearly separate terrains, a closer relation is present in views based on the structuration theory of Giddens (1976). The socio-technical duality of this theory holds that social and technical entities can be clearly distinguished, but that they interact and influence each other in a way that goes beyond the enhance/constrain relation in dualistic views.

Structuration theories recognise that two kinds of entities exist, the social and the technical, that they coexist in close proximity and that neither takes automatic precedence over the other. Neither the human nor the technological determines the outcomes by itself. Although the mutual influence is recognised, structuration theory accepts only human agency and cannot find any place for the agency of machines. In these views technology is still “used” and this use is dependent on human interpretations. People are ultimately in control of technology.

According to Giddens (1976) humans draw on the rules and resources within the structural features of society in order to produce and reproduce these structures. It is important for Giddens to emphasise the role of human agents in this process in his

attempt to overcome the objectivism of structuralism and functionalism, and the subjectivism of interpretivism. Subjectivism is overcome by emphasising the constraining and enabling availability of rules and resources, and objectivism is overcome by stating that structures do not have an objective existence, but only exist as “memory traces”. Structures are reproduced through recurrent human actions. The “duality of structure” refers to the availability of structural features to human in the processes of reproducing the structures. Although human agents are central in the structuration process, they are not in control of the outcomes because of the unintended consequences (Giddens, 1976:77) and the unanticipated conditions of human action.

For Orlikowski (1992), who is one of the important proponents of a structural approach in ISR, technology displays structural features by containing rules and resources on which users draw in the production and reproduction of structures. The “duality of technology” functions in the same way as the “duality of structure” because technology contains the rules and resources on the basis of which the social structures are produced and reproduced through recurrent use of technology.

In a later work Orlikowski (2000) realised that this view of technology is problematical within the context of Giddens’ views where structures do not have a material existence. Orlikowski therefore avoids allocating any substantive features to technology. Technology does therefore not embody structure and the use of technology does not produce structures as such. Orlikowski wants to remain true to structural theory by taking a “practice” perspective. Humans produce and reproduce practices by drawing on the rules and resources in these practices. Structuration happens when humans draw on rules and resources (structural features) in the ongoing production and reproduction of structures. The structures emerge from this process and are not embodied in technology (Orlikowski, 2000:407). Users do not “appropriate” the existing inherent features of technology, but they “enact a set of rules and resources which structures their ongoing interactions with technology”. People are involved in practices and through their recurrent use of technology enact rules and resources which structure their interactions with technology. Structure is therefore not in technology or objectively in practices, but is enacted through recurrent actions. Technologies are used as resources in the ongoing processes of structuration of the practices. While the

ongoing structuration draws on the structural features inherent in the practice, technology would be used in a selective way. If, for example, a practice were to be dominated by the structural features of individualism and competition, the technology such as Lotus Notes would be used in a very limited way. Although Lotus Notes have inscribed certain cooperative features, such as email and group discussion tools, the continuing structuration of the practice may not draw on these features. Although these properties are part of the design of the technology which allow or disallow certain uses, it often happens that technology is not used as intended by the designers. The technological artefact is, however, of little value and has no effect if it is not used.

Orlikowski (2000) further distinguishes between the technological artefact (hardware and software) and technology-in-practice. Although the technological artefact has certain properties, users choose which features to draw on in the enactment of structures. They may use it in ways not anticipated by designers because they are always in the position to choose differently. The recurrent use of technology in a certain way establishes technology-in-use as a structural feature which is drawn on in further structuration. The recurrent enactment of a particular technology-in-use establishes structures which further users would draw on. It is only through the recurrent use that technology becomes part of the structure and not because of its inherent features.

A central feature of structuration theory is to explain how practices change/remain stable. This should purely be attributed to recurrent human action through which structures are established. The stability/change could not be attributed to technology or any other entity. Technology also does not provide the structural features of rules and resources for the structuration process. It has inherent properties that could become rules and resources in the process of enactment. There is no direct link between these features and the ways they are enacted because it is mediated by human interpretation of the relevance of these features. Orlikowski shows how technology is differently enacted in different practices and that groups select the features of technology which would reproduce their structures. Change in the practices would only happen if people choose to do so. The inherent features of technology is therefore less important for Orlikowski because it is not these features that lead to certain outcomes, but the human practices within which technology is

used and which act as the principle of interpretation and selection. For Orlikowski the substantive view of technology does not make sense because of the many different ways in which technology is used/effects it has in a particular practice.

Within the context of structuration theory, the notion of emergence refers to the dynamism and changeability of practices through human actions and the notion of structure refers to the stability that is always present. The focus on technology-in-practice suggests that technology cannot be investigated in isolation but that it always forms part of a broader network within which it finds its particular definition. A direct relation cannot be made between the inherent features and the particular use of technology in a certain context.

With her practice view Orlikowski leans towards the social constructivist side and has very little to say about the effect of the inherent features of technology. It is clear that no agency is attributed to technology, only to humans who use the technology. Orlikowski emphasises the ability of people to choose differently and to enact technology in a different way. Although the opportunity for a different choice is strongly enhanced by the nature of advanced information technology which is programmable and allows for tailor-made use in a particular context, the technology itself does not have any effect. The different uses of technology are attributed to human agency as the ability to always choose differently.

It seems, however, that human choice remains untheorised in this view. It is not clear whether this choice is a free action, or whether choice itself might be influenced (or produced) by the inherent features of technology. The possibility that technology does only provide a menu of choices, but might also produce choices, is not considered. Humans are portrayed as freely choosing agents and technology is placed in the role of providing those choices and of making their exercise possible. Humans freely choose which features of technology to draw on based on their preference for a particular outcome.

Giddens (1976:77) relates the possibility of unintended outcomes of intended human action to the fact that humans are not fully knowledgeable when they take decisions. They are not fully knowledgeable because of the unacknowledged conditions of action. The implication is that a more intentional outcome would be reached if humans were more knowledgeable about all the contingent conditions. This view is

based on the sharp distinction between the active and choosing human and the passive material object related to the conditions of action. In the light of the complexity of every situation, it is understandable that humans cannot know all the factors that need to be taken into account when deciding on a course of action. The issue is whether all these factors could in principle be known in advance and whether they could be brought under human control. The question is also whether some kind of independent action could be attributed to other factors/entities whose effect contributes to the intended or unintended outcomes. The acknowledgement in structuration theory of the unacknowledged conditions and unintended outcomes of human actions suggests that other factors besides human decisions play a role in effecting the outcomes. If the outcomes are not the effect of people's choices then structuration cannot be seen as a purely human process because these other factors may also be nonhumans. It remains a question within Giddens' thinking what exactly the cause could be of the unintended consequences of human actions. It is clear from Giddens' thinking that they are unintended from a human perspective which means that they are not anticipated or planned or controllable by humans. In Orlikowski's account it means that the outcomes of structural transformation cannot exactly be planned or predicted.

The role of a technological agent is implicit in Orlikowski's thinking. In spite of her strong and exclusive emphasis on human agency, Orlikowski recognises the power of technology. She acknowledges that the use of information technology in business and on the internet requires a level of standardisation which limits the freedom in a particular context. These standards "reduces the degree of freedom available to users to experiment with and modify their technological artefacts in use" (Orlikowski, 2000:424). This seems to go against a central tenet in structuration theory that humans are always in a position to choose differently. She maintains, however, the need to understand human agency and "the essentially transformational character of all human agency, even in its most utterly routinized forms" (Giddens in Orlikowski, 2000:425).

The critical potential of this statement lies in the ability of human agents to change any social structure however deeply it is entrenched. A precondition for such a change is the understanding of the processes of structuration to see which and how structures are enacted through human action and choice. If these choices are made

explicit, the possibility for “choosing differently” is created. This critical potential is an important antidote to substantive views of technology where the human is relegated to a passive and accepting role as suggested by Heidegger’s (1977) notion of “Gelassenheit”.

The view of Orlikowski is humanistic because of the centrality of the human agent and the ability of the human agent to choose. Such a human agent is never the victim or the product of technologies. The use of technology is never arbitrary because it is part of the structurational processes. The agent is always within structures which are not objective entities but the outcome of recurrent human actions. As such the view of Orlikowski provides also an antidote to Kallinikos’ view of technological substantivism and determinism. Whether or not the technology or the work processes are changed is an intended outcome of people’s knowledgeable actions.

The value of a structurational approach to technology is the realisation that technology displays particular properties in use which may be different from that intended by the designers. In this way technology is not seen as a static entity, but as an element in a social context.

According to Berg (1998) the problem with a structurational view of technology is that its allocation of agency to humans only causes “technology to vanish from their accounts, appearing only as an occasion for structuring, without any activity or specificity of its own”. Rose *et al.* (2005:145) agree with this by indicating that the capacity of technology to affect outcomes is not acknowledged by Orlikowski and is seen as “props and tools for knowledgeable human agents”. Hanseth *et al.* (2004) and Hanseth (2005) show how Orlikowski’s separation between technology-as-practice and the technological artefact is problematical. The issue for them is the relation between the two. In Orlikowski’s view the features of the artefact provide a range of choices for human subjects to draw on in the enactment of structure. The important question for Hanseth *et al.* (2004:118) is to understand how “technology-in-practice is actually shaped by the technological artifact”. The authors relate the problem in Orlikowski’s view to central elements of Giddens’ views. While research into Information Systems based on Giddens’ structuration theory relates the social and the technical it does not conceptualise technology as such. In these views

technology only functions as an occasion for structuring and is seen as part of the “structure” which stands in a relation of tensional opposition to the (human) agent.

Although structuration theory is not a critical theory as such, it enables a critique of technology-in-use. The critique is not aimed at technology as such, but at the processes of structuration in practice. This critique is aimed at the structurational processes operating in practices. To make critique possible, insight should be gained into the ways in which humans choose to enact only certain structural features and not others. Since structures could only be produced and reproduced through human action, the possibility for transformation is always present. Transformation is possible under all circumstances because the human agent is able to choose differently. Since structures are not fixed entities but dependent on recurrent human action, and since human action could always be different, all structures could be changed. The critique of technology focuses on the use of technology in the enactment of structures. Since the way technology is used is dependent on human choices and humans can always choose differently, they are responsible for the outcomes and any outcome could have been different.

Jones & Karsten (2008) indicate in their comprehensive overview the significant contribution of Giddens’ theories in ISR. Their discussion of Adaptive Structuration Theory, “duality of technology” and critical engagements with structuration theory (p. 142) is also followed in this study. The intention is not to go beyond the way in which Giddens is being used in ISR.

6.2. Adaptive structuration theory

A variation on structuration theory is presented by DeSanctis & Poole (1994) who contrast two approaches to the study of technology in organisations. The decision-making school attributes strong agency to technology which determines or strongly influences its own use because of its inherent structure. The institutional school places the emphasis on social practices that draw on the structural features of technologies in order to achieve social change or stability. The authors look for a way to include both the structure of the organisation and the structure of technology.

The authors found structuration theory limited because it does not adequately take the structural features of technology into account and focuses more on institutional

levels and interpretive methods (*ibid.*, p.142). They attempt to avoid the interpretivism of structuration theory by bringing what they regard as the inherent features of technology into account. In this process they establish a relation between the structure and the use of technology. The use of technology is not simply based on the construction of meaning, but also on the features of technology. These features do not simply consist of structural elements, but also of the “spirit” of the technology. The spirit reflects the basic philosophy of the specific technology and could be coherent or loosely assembled. If the spirit is coherent technology is used in a more definite way. The use of technology could also be in accordance or in discordance with the spirit. The spirit is not a fixed feature of technology, but could be further defined through the way technology is used in an organisation.

The spirit and the structural features of technology provide the rules and resources, the “structural potential” which groups can draw on to generate particular social structures in interaction (*ibid.*, p.127). In this process the structural features in technology are “adapted” or “appropriated”. Appropriation refers to the realisation of the structural features (rules and resources) of technology in a particular context and “adaptation” refers to the “interplay” between the structure of technology and the structure that emerges when technology is used. “Appropriations are not automatically determined by technology designs. Rather, people actively select how technology structures are used, and adoption practices vary” (*ibid.*, p.129). It is a decision making process where the actions of humans are described in terms of ways to “actively select” or “choose” the structural features that are to be drawn upon. While technology provides a wide range of possibilities, it remains for humans to choose which structures to use, whether to use technology faithfully and for which instrumental purposes to use it (*ibid.*, p.130). Appropriation is influenced by the structural features of technology, the task, the organisational environment, and the group’s internal system (*ibid.*, p.131).

DeSanctis & Poole (1994) attribute a kind of agency to technology since it contains structural features. In this way they move beyond the structuration theory of Giddens who avoided the allocation of material existence to structures. The authors remain associated with structuration theory in the sense that humans are the important agents. It is only humans that could actively participate in the structuration process by drawing on the structural features in technology. This is not explicitly stated in the

article, but it becomes clear when the authors, in their empirical account of structurational processes, record only human conversations and show how they contribute to the ongoing structuring processes through their actions and words.

DeSanctis & Poole (1994) make a positive contribution to an understanding of the role of technology by emphasising the features of technology and by showing that these features play an important role in the process of structuration. They show how a number of structured elements relate to each other in a complex process of structuration. This explains why the outcome of such processes cannot be predicted and why the same technology leads to different outcomes. They also avoid social constructivism because the outcome of the structurational process is not necessarily as intended by human actors. They do, however, remain with the interpretative approach of structuration theory in their allocation of agency to humans and in their denial of a stronger form of agency to technology. They do not yet acknowledge an “independent” agency to technology and regard it mainly as a resource for structuration. The authors operate with a strong notion of human agency and autonomy when they describe how humans take decisions and choose from the features of technology to appropriate. This explains why it is possible that the personality of a person, or the style according to which a person interacts with technology, such as that of the autocratic leader, determines how technology is used.

Although DeSanctis & Poole go further than Orlikowski (2000) to explain the relation between the features of technology and its use, they still leave aspects of human agency unexplained. No explanation is provided of how the autocratic leader comes into being or is being maintained and of the possible role of technology in the process. The particular characteristics of human agency are taken for granted and used to explain the selection of features of technology. The theory does not allow theorisation (description, recognition, evaluation) of the effects of technology that are not part of the process of conscious appropriation. Appropriation by people refers only to the structural features and spirit of technology, and does not take into account that the technology may have other effects as well that may or may not be desirable or which may not necessarily be part of the structures or spirit of the technology.

6.3. “Perceived autonomy” of technology

Rose & Truex (2000) attempt to resolve the important differences between ANT and structuration theory, which lie for them in the opposing views of machine agency. Whereas structuration theory denies any kind of agency in relation to machines, ANT makes it possible. The authors found Jones' (1999) attempt to resolve the tension between ANT and structuration theory too limited because it does not provide a strong analytical perspective to the researcher and it is not true to either of these approaches.

For Rose & Truex (2000), the question whether agency could be attributed to technology is dependent on the way agency is seen and on the research approach that is followed. Two such approaches are contrasted. The developmental and longitudinal approach to technology reveals its human elements which become visible to the user familiar with it. This approach makes it possible to recognise a strong sense of human agency. On the other hand, the cross-sectional analysis of the use of the technology reveals it as a black box with strong agency. These two approaches are stated as follows:

Machine agency can appear quite strong as long as the machines are taken as blackboxes and observed in use over a short period, but strong agency tends to disappear when the development system is considered historically. (Rose & Truex, 2000:12)

When the two kinds of agency are compared, the agency of machines is limited because human characteristics of intentionality, flexibility, choice, decision-making and volition cannot be attributed to it. In both cases the attribution of agency does not come from the entities themselves, but is a matter of “perception” on the basis of a chosen view or research approach.

Perceived autonomy is a property partly derived from what people think the machine has and does, and is partly from what is designed into the machine. (Rose & Truex, 2000:15)

In this conceptualisation, Rose & Truex (2000) develop a position that they regard as consistent with both structuration theory and ANT which they associate with the development and use of technology respectively. They want to simultaneously hold on to a use-view of technology seen as a black box, and to a design-view which sees it as the product of human action. By imagining both stories and by drawing on both structuration theory and ANT, the authors believe that both human and machine

agency could be brought into the picture depending on the theoretical stance from where the field is approached.

While Rose & Truex (2000:16) want to work with both theoretical perspectives simultaneously, the

trick becomes living with the anomalies and remaining in the difficult dialectical centre, rather than trying to resolve one problem at the expense of impoverishing the wider analytical repertoire.

While Rose & Truex's attempt to engage with two major theoretical approaches in ISR, their claim to do justice to both is not successful. It has to be acknowledged that structuration theory and ANT are incompatible research paradigms since they hold radically different ontological and epistemological views. It is not fair to either of these approaches to allocate structuration theory to the development of technology and ANT to its use, since both theories have important implications for the reverse processes. It is of interest in the view of Rose & Truex how the interpretive tensions are brought about by the juxtaposition of different perspectives on technology. We will see how this aspect is developed further in ANT.

The notion of "perceived autonomy" is problematical because it does not answer the real question whether technology could or could not be an agent. The answer to this question is important in order to establish what kind of agent technology could be. Making the agency of technology dependent on human perceptions is a form of radical humanism. It is also not clear what the notion of "perceived autonomy" that is being attributed to technology means. Could not the same be said of humans if their autonomy is only seen from a particular theoretical perspective? While Rose & Truex (2000) work with a clear distinction between the design and use of technology, it is not clear where the "emerging" (*ibid.*, p.16) properties of technology come from. It is clear that these properties are not designed into technology, nor could they be said to emerge from the black box which is as such a fixed entity.

6.4. "Double dance" theories; combining structuration and ANT

Various researchers attempt to recognise the agency of both humans and technology and try to describe the nature of these agencies and the way they interact. This is done in a way that attempts to overcome the differences between

structuration theory and ANT. Since ANT will be described in detail in the following chapter, it suffices to state at this stage that it allocates some kind of agency to machines and that it sees the relation between machines and humans in a symmetrical way.

Jones (1999) draws on both structuration theory and ANT in his theorisation of the relation between humans and technology. To achieve this, he uses Pickering's (1995) notion of the "mangle of practice" which refers to the intermingled and indistinguishable way in which humans and machines interact. Via Pickering he also refers to Ciborra & Hanseth's (2000) notion of "drift" to indicate how unpredictable the outcome of the mangle is and that it is not simply the product of human intentions.

The outcome of the "double mangle" or "double dance of agency" is seen as "emergent" where "both material and social agency are mutually and emergently transformed" (Jones, 1999: 297). This means that the outcomes cannot be directly related to either human or technological agency. It is, however, important for Jones (1999:299) to postulate the priority of the "knowledgeable" human agent. He maintains that the social and material agencies are not symmetrical or equivalent and that the ultimacy of the human agents lies in their ability to take initiative and to interpret. Since interpretation is central to the design and use of information systems, human agency must take precedence.

Thus, if a user believes that the technical components of an information system possess particular properties, for example perceiving an application as fast or slow, then this may influence their use. (Jones, 1999:298)

Material agency, on the other hand, cannot "enforce itself over human agency", but is "instantiated in use" (*ibid.*).

Another attempt to reconcile structuration theory and ANT is presented by Rose & Jones (2005) who draw critically on ANT and structuration theory in their "double dance of agency". This dance is performed by human and machine agencies that interact with each other and that are intertwined. These agencies are not equivalent because humans have intentions and forms of awareness which machines do not have. The outcomes of this process cannot be anticipated and are described as "emerging". Their model takes from structuration theory the notion that structures are

reproduced through human agency but that the outcomes are not predictable because of the unacknowledged conditions and unintended outcomes of human actions. It differs from structuration theory in the allocation of agency to machines. Technological agents are part of the resources human agents draw on in the structurational process. The effects of machine agency are the outcome of its material capabilities and do not simply lie in human perceptions as viewed by Rose & Truex (2000) above. The model takes from ANT the notion that machines could be agents, but they criticise ANT's thesis of symmetry because the agencies of humans and machines are not equivalent.

The model consists of accounts of the properties of agency, the processes of agency and the conditions under which agency is exercised. Agency is described as "the capacity to make a difference" and applies to both humans and machines in different ways who display different properties of agency. Human agency comprises the properties of self-awareness, social awareness, interpretation, intentionality and self-reflection (Rose & Jones, 2005:28). Machines could function in different ways: they could act as tools in human hands, as proxies acting on behalf of humans, or as automata which take over a minor element of human decision making. The two kinds of agents are also involved in different processes. Machine agency should be understood against the background of the intentions of human designers and the conditions under which the machines are used. Human agency is related to intentions and awareness as inner processes. Machine agency is mainly the setting within which human agency functions and it provides enabling or constraining conditions. Humans, on the other hand, are actively involved in network building and marshalling. The conditions of agency are described as a "situational network" which influences the process.

It seems, however, that Rose & Jones (2005:27) follow a basically constructivist account when they state "the mutual transformation of human and machine agency that emerges through their interplay, influences social practice through changes in the perceptions of social actors". The social constructivist view lies in the notion that social practices are only changed through the perceptions of social actors. The authors also express a preference for the adaptive structuration theory which allocates to technology the role of material resources that are being drawn upon in the structuring process.

A similar view is presented by Rose *et al.* (2005a). They criticise structuration theory for not allocating agency to machines and they criticise ANT's thesis of symmetry for claiming that humans and machines are the same (equivalent). Rose *et al.* (2005a) allocate agency to both humans and machines but state that they are not equivalent (symmetrical), since human characteristics such as intentionality is not available to machines. They regard the agency of both to be intertwined in a "double dance". Both kinds of agency takes place within a particular situation (such as social structure – Giddens, or material objects – Callon) which makes it possible (*ibid.*, p.146). Human agency therefore reflects typical human characteristics such as strategic planning and interpretation. Humans also involve machine agency which enable or constrain elements of the exercise of human agency (*ibid.*, p.147). Machine agency is independent in the sense that they cannot be controlled by humans who cannot foresee their consequences.

The attempt of the "double dance" views to combine structuration theory and ANT is subjected to the same critique discussed above. Although they allocate a stronger sense of agency to material objects than the role allocated in "Perceived Autonomy" (Subsection 6.3 above), humans are in principle placed in a position of dominance. In their attempt to distinguish the role of humans and technology, these authors have to define humans and technologies beforehand so that the kind of agency could be described in line with their respective natures. This leaves the question of the positioning from where the researcher makes this distinction. How do we know what these distinctive natures are if we are already affected by technologies? It is not clear exactly what the role of the social structure is that makes agency possible. If these contexts make agency possible, should they not rather be regarded as the real agents? It is also not clear exactly what kind of things are caused by machine agency and in what sense machines do not remain instruments in human hands.

Brooks & Atkinson (2004) combines structuration theory of Giddens and ANT in what they call structurANTion theory. This is used in a case study involving the diagnosis and treatment of breast cancer. They show how an actor-network could become emancipatory by changing the focal actor from the surgeon to the patient. In the new "humanmachine" network the patient controls all aspects of the medical processes. Although this approach draws on some key features of ANT such as the actor-network, it does not do adequate justice to ANT since the focal actor is still a pure

human thereby denying the way in which ANT operates with hybrids. An adequate account is not given of the way in which ANT and structuration theory differ such as the latter's notion of duality and the idea that structures exist in human minds.

The awareness Jones & Karsten (2008: 146, 150) show for the need to research technology further from a structurational perspective, underlies the lack of such a theorisation of technology within the structurational research paradigm in IS. They also suggest that the research should explore conceptions of technology within the context of structurational theory "without recourse to concepts such as structures embedded in technology" (*ibid.*, p.149). After their critical reflection on Adaptive Structuration theory and conceptions of the duality of technology, they envisage the possibility of material agency, of the "agency of the ensemble as it is instantiated in practice" (*ibid.*, p.150). This suggests closer dialogue between structuration theory and ANT which needs to be explored further particularly through an engagement with the later work of Orlikowski & Scott (2008).

6.5. Sociomateriality

A transition is made from socio-technical views to "hybrid" (ANT), "cyborg" (Haraway, 1991) and "sociomaterial" views when the separate existence of the social and technical is being questioned and the boundaries become blurred. These views do not operate with a prior conception of social and technical entities which are then brought into some kind of relationship. They see the identity of these two kinds of entities as mutually constitutive in the relationship. They also attempt to move away from the dualistic views discussed above.

Orlikowski (2005) moves away from structuration theory when she attempts to account for the way in which technology operates. She acknowledges the possibility of a kind of material agency in relation to technology. She resists the ANT notion of symmetry by maintaining in principle and in practice the difference between "human agency" and "material performativity". What is significant in relation to the earlier discussion is when she states that the view which acknowledges both kinds of agency,

allows us to recognize the unanticipated conditions and unintended consequences of temporal intertwining, thus reclaiming the bases from which to make some observations about institutional outcomes, social purposes, and human reflexivity. (*ibid.*, p.185)

She acknowledges here that humans are not the only agents and that unintended consequences may result from material performativity. This claim represents an important transition in Orlikowski's thinking because it points to a large area of action that could not be attributed to humans.

Orlikowski & Scott (2008:20) find two problems with the socio-technical approaches to the study of technology in organisations. It is limited because they tend to focus on specific technological interventions and do not see "how organizational practices *always* entail some sort of technological (or material) mediation" (*ibid.*). Technology should rather be seen as an "integral part of all organizing at all times, places and circumstances". They also find these approaches limited because of the "assumption that technology and humans (organisations) are separate in the first place" (*ibid.*). Orlikowski & Scott (2008) move in this study away from structuration theory by claiming that a clear distinction cannot be made between humans and technology. Inspired by the sociology of technology, they develop an ontology of relationality in which the basic unit of analysis is not the separate entities, but the relations between them. They propose a sociomaterial approach through which work practices are performed. They describe two case studies in which the effects of the sociomaterial are not simply the outcomes of human decisions. They intend to overcome what they regard as the problematic notion of symmetry in ANT by distinguishing different roles to the human and the technological. Exactly what these roles are is not clear in this study.

Orlikowski (2005) and Orlikowski & Scott (2008) make an important shift away from structuration theory by questioning the boundaries between the social and the technological. It seems, however, that they are not fully consistent in this shift. Their preference to talk about work practices instead of the more neutral "network" reveals a bias towards the social as consisting of pure human relations. They also seem to evaluate technology in a predominantly negative way when they found that the "increased invisibility of technological entailments in everyday work practices are troubling, as they limit our capacity to understand, monitor, reflect on, and change them" (Orlikowski & Scott, 2008:41). They also suggest that the effect of technology

is mainly negative and that we can eventually separate ourselves from technology in order to understand, monitor and reflect on its effects. Their conception of practice is still defined in structurational terms as the reproduction of social order through recurrent human action (Orlikowski & Scott, 2008:26).

Woolgar (2002) questions the duality as such by showing how the boundary is drawn in different ways by various authors in the special issue of *Theory, Culture and Society* (Vol.19, Issue 6/7, 2002). He realises that the duality cannot simply be done away with because it is deeply entrenched in our language. An attempt to overcome this duality is present in the suggestive question: “the more material, the more social?” (*ibid*.p.268). The question implies that the relation between the material and the social is not that of two separate kinds of entities, but that the one is already implied in the other. He takes the notion of entanglement a bit further by describing it as “mutually stimulating”. In relation to electronic technology he argues that instead of the “virtual” replacing the “real”, what is perceived to be the boundaries between the two becomes obscure as presented in his “fourth rule of virtuality – the more virtual the more real” (*ibid*). The attempt to overcome the duality is one where the need to draw a boundary is being questioned. This continual redrawing of the boundaries suggests on the one hand that the duality persists, but also that the nature of each of the entities cannot be defined in an essentialist way. He finds the same kind of duality in symmetrical views and ends with the question of how the dualities could be overcome.

This question of Woolgar brings us back to the dichotomy of the social and the technical, but with the realisation that we are caught in a language that prevents us from thinking differently. If language is seen as a technology it illustrates in a paradoxical way the entanglement, the mutual shaping, and the blurred boundaries of the social and the technological.

7. Conclusion

This chapter used a conceptual analysis to describe the ways in which technology is being conceptualised. It showed how these categories could be related to the critical approaches to technology discussed in the previous chapter. It also indicated how the work of different authors could be related to this analysis and that different and

often conflicting conceptualisations of technology appear in the work of a single author. This conclusion summarises how conceptions of technology relate to different views about the nature and possibility of critique, and it summarises the central issues that have to be addressed in a theory of technology.

The different conceptions of technology make different approaches to critique possible. In the optimistic substantive view technology is seen as a benevolent force which should be developed and used as much as possible and without much reflection. The only notion of critique relates to the failure to expand technology to further terrains. This view is present in Castells's (1996) belief that the third world could develop in an accelerated way through the employment of technology. According to a pessimistic version of the substantive view, technology is seen as necessary in many ways, but mainly harmful. The critique of technology focuses on measuring and anticipating these harmful effects and is present in the views of Heidegger (1977), Ellul (1964) and Postman (1993). Instrumentalist views of technology have a very weak notion of critique because it is seen as a neutral tool. In the dualistic views inspired by Habermas, technology only comes into focus when it intrudes on the human terrain. Technology itself is seen as a relatively neutral tool which could be investigated through purely technical means.

On the other hand, constructivism makes a strong form of critique possible because it provides the means to open the black box of technology in relation to its design and shows how social biases are embedded in technology. Technology must be deconstructed in order to unveil these embedded biased practices, values and interests. It must be shown how the inherent features of technology favour a dominant group and exclude the interests of other groups. The purpose of critique is to find participatory ways to develop technology in order to include the interests of the marginalised and to promote human freedom and autonomy. Technological projects should be planned with much more care in order to ensure that the right kinds of interests are designed into technology. The somewhat deterministic assumption is that the design strongly shapes the use of technology. When constructivism focuses on the use of technology, critique deals centrally with the way technology is shaped by the context. It shows how an authoritarian organisation selects those aspects of technology which would promote managerial interests. Since technology is interpretively flexible, the focus should be more on

organisational elements than on the technology itself. An instrumentalist view of technology underlies this conception. A strong humanist bias is inherent to constructivist approaches with the result that critiques focuses on human actions and beliefs and only focuses on technology in so far as it reflects these human interests.

The humanist bias is also present in various kinds of sociotechnical approaches which draw on Giddens' structuration theory. Although this theory does not enable critique of technology as such, it does make provision for the critique and transformation of structures and institutions. Since structures do not exist in a fixed and objective way, but are the outcome of recurrent human action, they could always in principle be changed. The human agent is always in a position to reflect critically on these structures and to choose differently. Structuration theory does not provide the means to explain how structural features become entrenched in technology and how these could create options that did not previously exist.

The ability to critique technology is becoming more complex when the boundaries between the social and the technical become blurred in sociomaterial approaches. Critique cannot focus on presumed inherent features of technology that it is inherently ideological and biased, or on a deconstruction of social meanings embedded in technology. Critique is also not based on a clear definition of human nature, or the interests of a particular group. It seems that many of the ways in which critique is understood is undermined in these approaches.

It seems from this chapter that coherent conceptualisations of technology are not present in critical approaches to IS. With the exception of the work of Orlikowski (who cannot be seen primarily as a critical theorist), technology is in general very weakly conceptualised. In order to further explore the nature and possibility of the critique of technology, the nature of technology, the possibility and nature of agency, and the applicability of the concept to both humans and technology need to be investigated. Critical perspectives are not yet adequately able to trace the roles played by technology in the socio-technical networks.

It is clear that the use of the concept "agency" in relation to material objects is problematical since it carries very strong humanistic connotations. While various researchers recognise a form of machine agency, it remains unclear what the nature of this agency is or how it relates to humans. The views of technology operate with a

largely dichotomous framework. Humans and technologies are described in essentialist ways. The assumption exists that they can be clearly identified and distinguished. It is generally accepted in this overview that clear definitions exist about the nature of humans and machines. Humans are defined in typical humanistic way as imbued with volition and choice. A general assumption is made that human nature could be described in an essentialist way and prior to any association. Technology is defined in more sophisticated ways from pure instrumental and computational views, to a flexible entity with many possible features that could function in different ways in particular contexts.

The result of the inability of most critical researchers to conceptualise technology is that no substantial difference exists between critical research in information systems and critical research in other related fields such as systems theory, organisational science, etc. The only distinguishing feature of critical IS is the mere reference to ICT without conceptualising the difference that ICT makes. ISR is mainly seen as organisational research with the addition that IS are involved. This is illustrated in Brooke (2002d) who does not refer to conceptions of technology. Although these fields are historically closely related and share many issues and methods, critical research in information systems has not yet separated itself adequately from critical research in these other fields by theorising the nature and role of technology and by analysing the contribution of technology in the establishment and maintenance of systems. It will be argued that the analysis of technology brings an important dimension to critical research.

In order to become critical of technology, one should be able to describe the roles played by technology more accurately. This calls for a language of analysis. The question which deals with the relation between the social and the technical is usually answered in such a way that these two entities are predefined as separate, well defined and distinct. Once this distinction is made, the exact nature of the relation could be plotted on a scale as either more social or more technical. The more fundamental question is whether we could talk about such a clear distinction in the first place or whether the boundary between the entities could be clearly drawn. It is not possible to recognise the possible ways in which the social and technical impact on each other if "essentialist" definitions about the two kinds of entities are maintained. In most of the approaches investigated here such an essential human

nature exists and the relation with technology is shaped accordingly. An essentialist view of technology claims that there are inherent features (through design) of technology and that a direct relation exists between these features and the effects of technology. If the relation with technology could be described in terms of “use”, then the inherent features determine how it could be used. An essentialist view of the human reserves the notion of agency to humans and associate concepts such as autonomy, choice, volition and intention.

This chapter discussed the variety of conceptualisations of technology in CRIS. It has been found that technology is understood in many different and conflicting ways. The narrative is told in such a way that the entanglement of the human and the technological comes increasingly into focus. The underlying argument is that these two kinds of entities cannot be separated since we have irreversibly become socio-technical entities. It now becomes a precondition for the critique of technology to understand and be able to describe this complexity.

ANT will be investigated in an attempt to find answers to these issues. These issues are further addressed in Chapters 4, 5 and 6. In order to properly understand an ANT approach to technology and critique, a general overview is required which is the focus of Chapter 4.

A perspective on ANT

1. Introduction

In the previous two chapters insight was gained into the challenges that need to be addressed in the attempt to formulate a critique of technology. The following three chapters analyse the ways in which these challenges could be addressed within ANT. In this chapter an account is provided of selected elements of ANT, in Chapter 5 an ANT perspective on technology, in Chapter 6 an ANT approach to critique, and lastly ANT approaches to the critique of technology in Chapter 7. It is necessary to start with a more general account of ANT in order to identify its basic ontology and epistemology without which its conceptions of technology and of critique could not be properly grasped. It is a danger, as with any other complex tradition, to treat selected elements of such a tradition in an isolated way and thereby distorting it. This broad overview provides a better understanding of various aspects of ANT and it shows how some misunderstandings could be clarified once they are seen against the background of the whole of the ANT philosophy.

This chapter provides an account of some aspects of ANT which are required for an understanding of technology and of the nature and possibilities of critique. The account of ANT draws mainly on the work of Latour while authors such as Callon and Law are used in a complementary way. ANT could be seen as both a range of

methodological strategies and tools, and as a set of theories of reality, knowledge and society. ANT's attempt to overcome the traditional separation between facts and values could be seen in the way it makes a form of critique possible through its analytical/descriptive sociological methods. The descriptive approach has enabled ANT to generate many empirical studies in science, organisations and in technology. Since these studies are, in the spirit of ANT, mainly of such a descriptive nature they do not make a critical perspective an explicit focus. This study indicates however that ANT, through its consistent sociological method, opens the door to a form of critique which is conditioned on an adequate description of networks. It therefore combines the sociological method of analysis and description with the possibility of critique.

In this chapter, various interpretations of ANT are discussed in order to identify some of the misconceptions and limited interpretations in as far as they are relevant for the focus on critique and technology. Some of these critiques of ANT must be understood against the background of the general development of ANT which has often interpreted in managerialist ways (Law, 1999; Monteiro, 2004:132; Saldanha, 2003; Star, 1991; Walsham, 1997). This study focuses on a more mature form of ANT in which many of the criticisms are responded to through the elaboration of some of the central principles.

The account of ANT in these four chapters presents a "translation" and not an accurate application of ANT. This is in line with Law's (1997) finding that ANT studies need not faithfully represent it. It attempts, however, to remain true to the spirit of ANT.

2. A research strategy

2.1. "Follow the actors"

ANT, developed by Callon (1986b), Latour (1987), and Law (1994), mainly operates in the social studies of science and of technology. The studies of science have been dominated by disputes between empiricism, rationalism and constructivism (Bernstein, 1983; Hesse, 1980). The social studies of science and technology tries to find a balanced position between these extremes by avoiding on the one hand the social causation of theories, and on the other hand the realistic and rationalistic

views of science (Bijker, Hughes & Pinch, 1987; Pinch & Bijker, 1987; Woolgar, 1991b, Law, 1994). ANT takes this further in its attempt to move beyond the subjectivism/objectivism dichotomy by questioning the primacy allocated to the social, empirical and rational categories.

ANT does not present itself as a theory by providing an interpretative framework and clear definitions of entities. Although ANT contains some principles (symmetry) and concepts (heterogeneity, actants) it should mainly be seen as a descriptive method of inquiry through which the constitution of a socio-technical network is investigated. ANT does not tell anything positive about the nature of and relation between entities in the network, but it describes a process of how to study things (Latour, 2004a:63). "Description", in contrast to "analysis", claims to reflect the absence of researchers' categories and evaluations. As sociology of translation it investigates how the interests of some entities are translated in the process of enrolment into networks of power. ANT is centrally interested in the ways in which these networks come into being and in how they are maintained.

ANT is a method, and mostly a negative one at that; it mostly says nothing about the shape of what is described with it. (Latour, 2004a:63)

As method, ANT takes the actors seriously. The method of description wants to show who the actors are, what they do and what their understanding is of what they do. No description can go beyond the actors themselves in order to find a deeper cause of their actions and beliefs. The actions of the actor cannot be explained with reference to a more basic structure such as an ideology, or the primitive drives in the psyche. Structuralism for Latour is wrong because it sees the actor as a mere placeholder of a structure, an instance of the rule (Latour, 2004a:72). In contrast to this ANT's

main tenet is that actors themselves make everything, including their own frames, their own theories, their own contexts, their own metaphysics, even their own ontologies. (Latour, 2004a:67)

There is therefore no need for external theories or for a metaphysics which would provide a deeper, better, and more true insight into what actors do. Methodologically ANT is looking for a "single grammar" and a "single semantics" with which different kinds of social entities could be investigated. This applies to both things and people,

or to investigations of the small (micro) and the large (macro) (Latour, 1995:280). ANT does not change register on the basis of a prior judgement of the category an entity belongs to.

The main focus of the sociology of ANT is to trace the processes through which the “social” comes into being, how it remains stable or collapses (Callon & Latour, 1981:301, Callon, 1986a). It has a dynamic view of the social which does not consist of fixed structures, but is continuously “performed” (Latour, 1986:271). The continual performance of the social means that its origin is always present and is being re-enacted in every process of assembling. The very same mechanisms that were present when a network comes into being, is still operating to maintain it. ANT therefore does not trace the origin of society in a distant past, but claims that the origin of the social is contested or established through every action of a social actor (Latour, 1986:270). In this process, ANT attempts to capture the social in the very process of making and remaking. The focus on this underlying dynamism of society provides important insights into the social order. This perspective on the making of an established order challenges the positivism of the presence. The implication is that any order, or process of ordering, however stable, large and powerful it may seem, could be traced in order to establish through which processes it comes into being and exactly how it is maintained. An important part of the study of the social is to establish how, what is in principle fluid and which could have been otherwise, became the way it is as a seemingly stable and irreversible order and how one state of affairs came to dominate through the exclusion of other possibilities. It focuses on key elements in the making of the social such as “where forces are translated, and the difference between the technical and the social is fought out, just where the irreversible becomes reversible...” (Callon & Latour, 1981:301).

Because of the centrality of these issues of power, the sociology of ANT is firmly located within the sphere of the conflict views of the social which is seen as a “war of all against all” (Callon & Latour, 1981:293). Central in this analysis is an understanding of how the powerful, the macro-actor, the “Leviathan” comes into being (Callon & Latour, 1981). In this process it traces how power is collected, stored and distributed in society, what the difference and the relationship are between the more and the less powerful, how the powerful maintains and secures their position of power.

This approach is in contrast to structuralist and interpretivist sociologies. In interpretivist approaches the social, constituted by human interactions, is the outcome of meaning-making process in human interactions. An adequate understanding of the social is possible through an interpretive process which leads to an understanding (*Verstehen*). In structuralist approaches, human actions (behaviour) is the product of underlying structures and the uncovering of these (often hidden) structures provides an adequate explanation of the social. ANT's emphasis on associations between individual entities which grows into networks, avoids the human-centeredness of the interpretivist approaches and the nonhuman determinism of structuralism.

The tracing of associations and disassociations wherever they are produced by actors (Callon & Latour, 1981:292; Latour, 1996a:10) could only be done by "following the actors". This basic research approach is expressed by Latour as follows: "Stick to the actors, my friend, stick to the actors. If they drift, we'll drift along with them" (Latour, 1996a:94). This entails that everything that actors do, how they relate to others, how they translate the interests of others, what they interchange, what they represent or "say", should be taken seriously. The method of description wants to show who the actors are, what they do and what their understanding is of what they do. ANT follows the associations in their trajectories by establishing how they develop (Latour, 1996c).

In this sense ANT wants to be true to Ethnomethodology in that

actors know what they do and we have to learn from them not only what they do, but how and why they do it. It is *us*, the social scientist, who lack knowledge of what they do, and not *they* who are missing the explanations of why they are unwittingly manipulated by forces exterior to themselves and known to the social scientist's powerful gaze and methods. (Latour, 1999a:19)

Their actions cannot be explained with reference to broader categories of which it might be an instance. The actors

too compare, they too produce typologies, they too design standards.....Why would you be the one doing the intelligent stuff while they act like a bunch of morons? (Latour, 2004a:70)

ANT's main tenet is therefore that actors themselves make everything, including their own frames, their own theories, their own contexts, their own metaphysics and even their own ontologies (Latour, 1996a; 2004a:67). This should prevent the researcher

from imposing schema on the actors and claiming to provide an explanation of their actions that is better than those of the actors themselves. In this way ANT proposes an 'agnosticism of the observer' (Bloomfield & Vurdubakis, 1999:631). It aims to overcome the problem of "ethnocentricity" where the "other" is always judged in terms of the categories of the own. To counter such a centrality of the researcher the methodological principle must be followed that "[N]o point of view is privileged and no interpretation is censored" (Callon, 1986b:200; also Bloomfield & Vurdubakis, 1999:631). One of Latour's (1987:176) rules of method states:

We should be as undecided as the various actors we follow as to what technoscience is made of; to do so, every time an inside/outside division is built, we should follow the two sides simultaneously, making up a list, no matter how long and heterogeneous, of all those who do the work.

The following of the actors requires an a-theoretical and non-evaluative stance from the researcher. The researcher should not use a "theoretical framework" with which to make sense of the entities under study. The need for such a framework is an indication that the description of the actants is not yet adequately done (Latour, 2004a). The use of a framework is often a structuralist technique which sees the individual entity as an instance of a more general rule. The empirical tracing of actors reveals how their associations become larger by covering large terrains, or how they fail or stop to associate. If all the associations between actors are traced, deeper insight cannot be gained from a larger framework used as a basis of analysis. An adequate description does not require any further explanation. If the need exists for further explanation, it is an indication that either not all the actors have been identified, or the description of the actors is not adequate (Latour, 2004a). The following of the actors leads towards sociology as a "pin board" which maps heterogeneous elements (Law, 2002).

In contrast to structuralist and functionalist approaches ANT shows how networks come together through associations (Latour, 1987; Callon, 1986a, 1996b; Law, 1994). In contrast to the structuralist approach, ANT investigates the active role of entities-in-association where each element is a "mediator" or actant which does not merely fulfil a function, but contributes in a unique way to the establishment of the network (Latour, 1996c:303). It is therefore important to realise that no description could go beyond or above the actors themselves. It is not fair to the actors to impute

to them “false consciousness” or to see their views as distorted and manipulated by macro-forces. These judgements are prevalent in critical approaches who claim that actors do not know, in an important sense, what “lies behind” or determine their action. They are therefore in need of the kind of enlightenment critical theory could offer.

ANT also differs from Giddens’ (1976) attempt to overcome the dualism of structure and agent in the structuration process where agents reproduce structures by drawing on the very structural features within which they find themselves. ANT moves away from any postulation of a duality or dualism by focusing on the one-dimensionality of associations that form a network. A seamless transition could be made between individual associations and the formation of larger networks. The larger networks could be “decomposed” by tracing the particular associations through which it is constituted. It may be possible for networks to obtain “structural” features, but these structures do not exist in an objective way in contrast to individual entities.

This approach of ANT is seen, by Walsham (1997) and others, as presenting a “flat ontology” since it does not utilise critical categories such as race, gender, class or capitalism to interpret and critically evaluate the actions of actors. ANT is seen as a very useful empirical method, but as lacking the qualities of a critical theory. But, from the perspective of ANT, these categories cannot be taken as objective structures to explain actors’ actions, but should themselves be treated as an effect of associations. It is true that ANT is “one-dimensional” in the sense that micro- and macro-actors are of the same kind and that the one cannot be explained in terms of the other. Whatever macro-theory is to be used to explain a particular situation, it has to be shown how this theory became an actant in this particular context.

An implication of the methodological rule to follow the actants is that the specific, unique nature of each collective could be traced empirically. Since no two networks are the same no generalisations across networks are possible. A generalised finding in one network cannot simply be applied to another. This is in line with the quest of Monteiro & Hanseth (1996) and Monteiro (2004:130) for specificity in information system research. It provides the instruments that would make possible a “fine-grained” analysis of the relation between the human and the technical in every distinguishable network.

2.2. *Human and nonhuman actants*

The sociology of ANT draws the principle of symmetry from the tradition of sociology of science (Law, 1994:10). The symmetry-thesis is developed in the Strong Thesis in the Sociology of Science (STSS) (Barnes & Bloor, 1982) and the Sociology of Scientific Knowledge (SSK) (Collins & Yearley, 1992a, 1992b). This thesis counters the rationalistic conception of science by postulating that both “true” and “false” science should be investigated in the same way. Whether science proves to be right or wrong, it should be subjected to the same kind of scrutiny in order to establish the origins of its claims. In both cases the reasons/causes of the acceptance or rejection of scientific theories should be related to the social context. “David Bloor argued ... that *both true and false knowledge deserve sociological analysis*” (Law, 1994:10).

In ANT the principle of symmetry is applied in three ways. It is symmetry of the kind of actor, of the size of the actor and a symmetrical approach as far as moral issues are concerned. In this process ANT overcomes the dualisms of subject/object, structure/agent, social/natural, human/nonhuman, large/small. The thesis of symmetry is methodologically valuable since it enables the study of the generation of distinctions and identities. This chapter deals with the first two aspects while the third aspect will be dealt with in the next chapter because it involves the issue of evaluation.

In ANT the symmetry-thesis states that all possible actants should be treated in the same way regardless of what kind of entity they are. This requires that no *a priori* distinction should be made between the roles of humans and nonhumans (ideas, machines, laws, nature) in the establishment of the social. ANT is centrally interested in the actor, but refrains from deciding beforehand who/what it is. The principle of symmetry leads to the acceptance of the inherent heterogeneity of any network which is made up of different kinds of entities.

The thesis of symmetry employed by ANT is a manifestation of methodological monism used to overcome well established dualisms of micro/macro, subject/object, and nature/society. Applied to the social/natural division, Callon & Latour (1992:348) states:

Our general symmetry principle is thus not to alternate between natural realism and social realism but to obtain nature and society as twin results of another activity, one that is more

interesting for us. We call it network building, or collective things or quasi-objects, or trials of force.

Instead of starting off with a dualism and then investigating what they have in common, how boundaries are crossed or renegotiated, ANT starts with a monistic conception and investigates how differences are produced. In contrasting the state of social relations and the state of nonhuman relations, Latour finds the place of the human in between.

This final diagram relocates humanity right where we belong – in the crossover, the central column, the articulation, the possibility of mediating between mediators. (Latour, 1999b:214)

Once this dualism is overcome, one could see that, from the perspective of assembling a network, every actant is of the same kind and could be assembled or dissolved through the same “social” processes. The material difference between things lies in the way the assembling took place. The difference is the outcome of the processes of assembling and does not precede it. There “is no order of things made for once and all” (Law & Mol, 1995:278). This methodological monism entails that everything must be explained and nothing can be taken for granted. In this process ANT does not add a new dimension to reality, as claimed by Collins & Yearley (1992b:378), but it sees only one reality.

The claim that both humans and nonhumans could be actants does not mean that all distinctions between them disappear. It is exactly the purpose of the thesis of symmetry to be able to trace how the differences are produced. In order to show how categories and “natures” appear, their existence cannot be taken for granted. The network-analysis cannot assume the categories which it wants to explain. The difference between “humans” and “nonhumans” cannot be assumed but must be investigated as effects of the networks of associations. A network cannot be properly researched when prejudices exist about essences such as “human” or “technology” since it predetermines the kinds of associations that are seen to be possible. Such prejudices narrow the vision of the researcher who needs to provide an adequate description of all the kinds of associations and how these associations shape the identity of the entities. If the identity of these entities is predefined, the analysis cannot establish how this identity came about.

The generalised thesis of symmetry should be applied consistently. Neither nature nor society could be taken as stable entities which explains the other, but both are themselves in need of explanation since

the anthropologist has to position himself at the median point where he can follow the attribution of both nonhuman and human properties. (Latour, 1993:95,6)

Seen from the perspective of the dualisms, the network is a hybrid, a heterogeneous assembly of different kinds of entities. It should be noted that utilising the concept *hybridity*, ANT still draws on the conceptual framework of the dualism because it assumes the pre-existence of separate categories. The use of the language which draws on the very conceptual framework ANT criticises should be seen as a strategic necessity in order to effect the transition to a different language. ANT suspends all such divisions in order to trace the composition of the network. To trace a network meticulously, one cannot decide beforehand what kind of entity is encountered and allow that decision to determine what kinds of roles it could play in the network. All entities should be regarded as potential actants. The identification of actants and of the ways in which properties are interchanged is obscured if decisions are made beforehand of what constitutes human nature or what the essence of technology is. In ANT the human/thing relation is relativised by showing that the boundaries are not clear cut and that they interchange many qualities to such an extent that the human cannot be defined without the material. This blurring of boundaries is discussed in some detail by Bloomfield & Vurdubakis (1994).

ANT is criticised for the way it refuses to make an *a priori* distinction between humans and nonhumans. The critique entails that the uniqueness of the human gets lost and that humans are easily subjected to nonhumans such as technology (Walsham, 1997:475). In such views it is necessary to be able to identify human uniqueness in order to protect it from technological domination and unwanted intrusion. Walsham refers to the comments of Pels (1995:138,9) about the way IT-enabled modern warfare subject humans to technology. This criticism is also articulated by Rose *et al.* (2005a:145) for whom it is not clear exactly how machines act or how they relate to human actions “with the implication that there is little difference between human and machine agency”. From this statement it seems that symmetry for them means identity. If this were true then ANT would be guilty of an *a*

priori belief about the identity of actants. The thesis of symmetry implies that insight into the differences between actants is a result of an empirical investigation of the actor-network (as is actually done by Rose *et al.*, 2005a). Differences are not given in the nature of things, but grow and develop in networks. The shift in the ANT language from agency to actancy is not fully acknowledged by Rose *et al.* (2005a) who continue to talk about ‘agency’. This shift is important because it attempts to bypass the issues brought about by claims of the uniqueness of the human agent.

Similar critique of ANT is also rendered from the Critical Theory perspective of Vandenberghe (2002) who is concerned about the identification of forms of reification and fetishism. Reification and alienation take place when human relations are converted to relations between things. Fetishism refers to the inappropriate attribution of human qualities to things. The essential distinction between the human and the material is crucial for the identification of human freedom in CT.

It should be clear that ANT does not deny the existence or usefulness of the human/nonhuman distinction, but claims that it is an effect of the network as a whole. Who the actants are in a particular network is a matter that sociologists trace empirically on the basis of what these actants do and what they say about themselves. This is why the words and behaviour of the actants should be taken seriously even though it might be regarded as “improper” for nonhumans to “speak”. The consequence of the symmetry-thesis is that no human or technological “essence” exists. What is regarded as human is dependent on the state of the network as a whole and in this sense also on the presence of material entities (such as technologies) in the network. It will be shown that it is not possible to think of the human without taking the role of the technological into account. ANT would therefore also disagree with Orlikowski’s (2005) a *priori* distinction between the kinds of agency of the human and the material in terms of human agency and material performativity. According to the ANT perspective Orlikowski has already decided what kinds of actions are typically human and how it is different from material actancy.

ANT steers a course between, what McLean & Hassard (2004) calls the extremes of symmetrical absence and symmetrical absurdity. The first extreme is when an a *priori* distinction is made between entities and the second extreme is when all

entities are treated in exactly the same way. The purpose of the tracing of the network in ANT is to show exactly how the differences are produced. Both these kinds of symmetry are guilty of a prior definition of the nature of entities.

2.3. *Large and small actants*

The second way in which the principle of symmetry is applied relates to the size of the actor. ANT applies the same method of investigation to micro- and macro-actors. It will be indicated that there is certain flatness methodologically, but that it enables the careful tracing of the emergence of the macro-actor. It will also be indicated that this approach allows the deconstruction of the macro-actor (global network, big company) and its presumed causal (dominating) relation to the micro-actor. This account of ANT is confirmed by Monteiro (2000:71, 82) who sees it as a promising candidate for a critical approach because of the way it allows a zooming in and out at different levels and by linking the micro- and macro-actors.

The separation in sociology between the micro- and the macro has been reformulated by Giddens (1984) in terms of the relation between structure and agent. The issue whether the source or cause of action should be searched in the (individual) agent or in the larger structure underlies many debates in sociology (Giddens, 1984; Dreyfus & Rabinow, 1982). Whereas interpretive approaches locate the source of agency in the individual (or group), structuralist approaches locate the cause of action in underlying structures. For the interpretivist reality lies in the particular and individual and for the structuralist it lies in the large and general. In contrast to these approaches, ANT moves beyond the agent/structure division by looking for a solution to the dichotomy in a different way. Latour (1999a) refers to the way social theory oscillates between these two foci where either the micro-terrain is seen as “more real” in ethnomethodology, or where the macro-terrain receives priority in structuralism’s search for “transcendental” structures. Reality is for ANT not to be searched for in the particular or in the general, but it should be seen as a circulating entity (Latour, 1999a:17) where neither of the poles receive priority.

In ANT the micro- and macro-actors are “isomorphic” (Callon & Latour, 1981:280), of the same kind (Law, 1992:380). Isomorphism means that no qualitative difference exists between them since the macro-world is made up of “the same stuff” (Law,

1992) as the micro-world. The only difference between the big and the small lies in the number of associations which make up the macro-world. “[M]acro-actors are micro-actors sitting on top of many leaky black boxes” (Callon & Latour, 1981:286). This quantitative difference refers to the breadth of the network of associations of the macro-actor. While the quantitative difference may translate into a qualitative difference when the macro-actor becomes more powerful, it remains a question of “how many are included”. Latour (1988a) shows how Pasteur’s network became global by means of the multitude of entities enrolled in it, including microbes, farmers, government and veterinarians. The whole of the collective is made up of the “same stuff” and the same processes operate at all levels. The way two entities relate in the micro-terrain of the laboratory is in essence not different from how an individual entity relates to a “structure”. The power of this approach of ANT lies in the way it describes how a macro-actor comes into being and is maintained through the multiple associations of micro-actors and how the power of the macro-actor holds only as long as these micro-associations remain in place. The implication for a critical perspective is that the powerful macro-actor could be challenged within the multiple micro-associations. The challenge of the power of the micro-actor is therefore within reach of the micro-actor.

Since the macro-actor has enrolled many entities, one would expect it to be qualitatively different from the micro-actor in the sense that it is more complex than the entities enrolled. This is, however, not the case because a precondition for the enrolment of others within the network is the process of simplification (Callon & Latour, 1981:299). The macro-actor simplifies the infinite complexity of the micro-actors it enrolls. The process of simplification is one of the mechanisms of power in the large network. The macro-actor is therefore simpler than the micro-actors it enrolls.

Because of the isomorphism of all actants, the same methods should be used to investigate them. If different methods are used to investigate the micro- and macro-actors, a decision is already taken about the difference (superiority) of the macro-actor. The result of such an uneven approach would be the uncritical acceptance of the size of the macro-actor as a matter of fact. Such a biased investigation would also merely reinforce the dominant position of the macro-actor. This methodological decision privileges the macro-actor because it already assumes that it is qualitatively

different and that its size could be attributed to its nature. The methodology assumes the size of the actor and does not attempt to explain it. ANT's methodological principle of symmetry of the micro- and macro makes it possible to carefully trace the translations which lead to the increase in size (Callon & Latour, 1981:281):

By claiming that macro-actors are more complex than micro-actors sociologists discourage analysis, and hamstring investigators. And they prevent the secret of the macro-actors' growth from being revealed: making operations childishly simple. (Callon & Latour, 1981:299)

Symmetry, which does not distinguish methodologically between large and small, does not imply that everything remains the same size or form, or that the micro cannot be distinguished from the macro. It is an analytical tool through which the differences are explained and not taken for granted as a basis for further explanations. This investigation uncovers how the difference in size is not a given, but the outcome of a "long struggle" (Callon & Latour, 1981:280). It is exactly the methodological neutrality regarding the size and form of the actor that makes it possible to trace the growth and the formation of actants empirically.

In a similar way it cannot be said that ANT denies the existence of "social structures" as such or their possible effect on individuals. ANT shows how these "structures" come into being and are maintained and how they obtain durability. In this way the structure (macro-actor) is subjected to the investigation which traces the trajectory and accumulation of power. By denying the independent existence of such macro-actors, and by showing that they are dependent on the successful enrolment of micro-actors, an important step is taken to address the dominance of the large and powerful.

Allen (2004) wants to address what he perceived to be a weakness in ANT because of what he regards as its one-sided focus on the micro-level. He shows how enrolment strategies are successful in the case of personal digital assistants (PDAs) when broader social and cultural processes in the form of technological frames are taken into account. The technological frame operates for Allen in a way similar to the Kuhnian paradigm by providing the resources for structuring. Although this concept of Allen is useful to explain how entities are realigned within a different network, it must also be explained how these frames came into being and how they remain stable. The important contribution of ANT lies in its basic principle that no structure

or frame which affects the behaviour of entities could be taken for granted, but should be subjected to the same kind of analysis as the entities affected by it. Such a structure cannot be used to explain change, but should itself be subjected to such an explanation.

The way in which ANT brings the local and the global, micro and the macro on the same level, invited accusation of a “flat ontology” (Monteiro & Hanseth, 1996) and “flatness” (Walsham, 1997) and a one-sided focus on the “local and contingent” (*ibid.*). It seems that Klacurá (2004:269) reads ANT with the dichotomy of local/global in mind because she sees actants as functioning at a local level, while the network represents the macro-level. In her mind, ANT is guilty of “eschewing historical analysis” because the local actors are seen in isolation from broader historical contexts. In her opinion “macro-theories”, such as those about class and gender, which are historically constituted, are needed to explain the action of individual entities (*ibid.*). According to her, ANT emphasises, methodologically, that a historical analysis cannot provide an explanation of what actors do although it provides the “occasion” for the ethnographer to trace larger networks. It is an open question within ANT how wide the network should be drawn for the purposes of any particular study. It assumes that any framing of a study is always arbitrary in a sense that it could be drawn differently in order to bring other actants into focus. Although not many longitudinal studies exist in ANT, the historical tracing of networks is not excluded from this process.

Walsham (1997) delivers a similar kind of critique. For him, the value of ANT lies in the way it brings the human and the technical together, but “ANT lacks an adequate analysis of social structures and the impact of social structures on individuals. It focuses rather on the local and contingent”. Walsham argues that where traditional critical theory traces conflicts to pre-existing social structures, these social structures are merely relational achievements in ANT. It is therefore, for Walsham, not possible in ANT to establish in what way individuals are influenced by social structures. He argues that ANT has to draw on political, ethical and moral theories originating from outside the network to really become a critical theory.

The important point of ANT is not so much to deny a macro-actant (such as structures), or their effect on micro-actants, but to argue that the way they come into

being and obtain their power as actor-networks could be studied in the same way as the relations between entities at the micro-level are investigated. The focus on the particular actor incorporates any “structure” the actor draws on. ANT attempts to avoid second guessing the actors by claiming to know what structures shape their behaviour. Such structures are themselves in need of explanation as macro-actors and cannot simply be used to explain the actions of others. If a larger structure is used to explain the actions and beliefs of a particular actor, the way the structure became large and its multiple ties with the particular actor should be traced. What is large has now a different meaning:

Big does not mean ‘really’ big or ‘overall’, of ‘overarching’, but connected, blind, local, mediated, related. (Latour, 1999a:18)

A theoretical explanation is relevant in a particular context if it could be shown how it actually connects actants with each other. The same issues related to the distinction between the micro- and macro-terrains come to the fore in studies of technology. Kallinikos (2004) emphasises the cross-contextual and self-referential nature of technology which cannot adequately be studied in a localised context. For him technology does not understand specificity (*ibid.*, p.153). Technology has a strong normative influence within any local context and the opportunities to use it flexibly are severely constrained by technology itself. Instead of the circulation between the micro and the macro, Kallinikos operates only from the general, abstract to the concrete to show how technology transforms a local context (*ibid.*, p.157).

Most of the time, the experience of single local contexts are transformed and transcribed into the standardized categories and procedures underlying the technological system. (Kallinikos, 2004:153)

The methodological stance to treat the micro and the macro in the same way, does not deny the existence or impact of the one on the other, but aims to provide the means to understand how the macro comes into existence. In order to link the micro- to the macro, something remains constant. In order to avoid from merely “pinning” more local details on the board, ANT is looking for the “fluid”, what remains constant in the process (Latour, 1999a:17).

2.4. Language and reality

The notion of networks is also needed to understand how reference between words and things is possible. In an attempt to overcome the problem of reference in a way that avoids the pitfalls of empiricism, rationalism and relativism, Latour (1999b:24) introduces the notion of “circulating reference” which draws on the processes of association and translation. Against empiricism, he maintains that reference is not the linear process through which objects “out there” are associated with words. Against constructivism it is maintained that knowledge of reality cannot merely be social constructions. Latour (1999b:58) shows how “multiple intermediaries” through chains of association and translations are needed to keep “something *constant* through a series of transformations” (*ibid.*) in order for a word to usefully represent an entity. The word does not simply reflect or correspond with the entity, but is tied to the entity through multiple smaller associations”. This link between the word and the entity may fail if the chains are not strong enough. The chains of translation link “things to texts, texts to things, and things to people, and so on”, and thereby make the things, texts and people real (Callon & Law, 1995:501). In this sense ANT is not a form of semiotics, where meaning is determined intra-textually without reference to things outside the text (see subsection 3.5 below).

The process of presentation is one where one entity/word makes the other present or real. The use of language is therefore not merely a reflection of reality, but also a creation thereof. Reality comes into being through the processes of assembly where more and different kinds of entities are brought together. The process of representing and creating reality does not only happen through words (or discourse), but includes the forms of representation of nonhumans who also “speak” and represent.

Sometimes re-presentation comes in the shape and form of words. But often it does not. That’s the virtue of all this work in science studies about laboratory science. Chains of representations *may* lead to words. May come to take the form of words. But they may equally well lead to, or take the form of, technical objects – for instance, instruments, or diagrams, or skills embodied in human beings. (Callon & Law, 1995:501)

In the same way that language not only represents, but also creates reality, contributes the representations by nonhumans to the creation of reality (Callon & Law 1995:500).

Cats, catflaps, computers, and fax machines – not to mention X-ray sources, safety interlocks, and keys – *all* these order and organize, create paths and links. All of these signify, but they do so in their own ways.

All resist, or have the potential to resist, re-presentation. Like the people and the interlock in the story about the Z rays. They have their specificities. They cannot be reduced to language. (Callon & Law, 1995:502).

In his comment on this, Jones (1999:294) correctly indicates that ANT makes a transition from a representational to a performative epistemology. It should also be clear that the epistemology of ANT is not socially constructivistic (as claimed *i.a.* by Mitev, 2003) since it allocates an active role to natural objects and technology. The implications for critical research of this view of language and reality, and the production of an object such as a text, will be discussed in the next chapter.

This section has indicated that ANT is in the first place a research strategy as described by the principle of symmetry. The following of actors is not a simplistic empiricist stance because the researcher is actively searching for relevant actors since the apparent actors are not necessarily the relevant ones. The presentation of research results in language also has important implications for the role of the researcher in the creation of reality.

3. The actor-network

The central focus of the ANT researcher is the actor-network, or the collective. These concepts should not be seen as nouns, but rather as verbs: to network and to collect. ANT experiences difficulty in finding for its ideas the most suitable names which do not carry too much theoretical baggage. Each of the concepts such as actor, network, mediation, etc. is already loaded with meaning. This uneasiness is expressed by Latour (1999a) who questions each aspect of the phrase “actor-network theory”. He (1999a:19) questions, for example, the hyphen in the phrase because it suggests two separate entities between whom a relation exists, while the actor-network actually refers to two faces of the same phenomenon. One has, therefore, to be careful when working with the connotations ANT wishes to attach to words. In this section Latour’s (2004b:28) concept of a “collective” is used to refer to a network, an “actor-network” or a “collectif” (Callon & Law, 1995). When the concept

“collective” is chosen, it should be understood that it does not indicate the “social” to the exclusion of the “individual”. In line with the notion of circulation described above Latour states that

[i]n spite of its use in the singular, the term refers not to an already-established unit but to a procedure for *collecting* associations of humans and nonhumans. (Latour, 2004b:238)

There is no consensus in ANT about the concept “collective” or “network”. Law & Mol (2002) state, for example, that the notion of network is not fine-grained enough to capture the intimate relation between the social and the technical.

3.1. Actor-network

The sociological analysis which traces associations between entities entails the description of networks which is centrally about the establishment of a certain kind of distribution based on a network of power. The analysis shows how power is assembled from different sources and how it is stored in a single place.

Before a more detailed account is provided of “actor” and “network”, it is important to emphasise the unity of an “actor-network”. The network consists of actants and makes actancy simultaneously possible. A network consists of, constitutes and is constituted by entities in association. The concept of an actor-network does not refer to two separate entities, because the network is an actor and the actor is a network. Actancy is only possible if a network is present and the presence of a network is an indication of actancy.

No identities exist outside and before the network. Actor-network does not mean that pre-existing actors come together in a network and establish relations among themselves. Entities stand in a relation with each other that constitutes them. An individual entity is not endowed with the potential to act since actancy is only an effect of the network. A “collectif” is not a collection of pre-existing things (Callon, 1987:93), but a property emerging from relations (Callon & Law, 1995). It is a dynamic entity, shaped by, and shaping the entities of which it is composed. The collective does not refer to the whole which incorporates everything, but it refers to the relations which constitute entities. Entities come into being through the relations. The process of coming into being is a process of relating to other entities. Relations are prior to essences, or “things in themselves” (Callon & Law, 1995:486).

The notion of the actor-network bypasses the categories micro/macro and structure/agent by postulating that social processes are a “circulating entity” (Latour, 1999a:17). This is indicated by the notions of “summing up” and “framing”. The network-pole does not refer to the macro or to the society, but it refers to

the *summing up* of interaction through various kinds of devices, inscriptions, forms and formulae, into a very local, very practical, very tiny locus. (*ibid.*)

The actor-pole, of actantiality refers to

[W]hat *provides* actants with their actions, with their subjectivity, with their intentionality, with their morality. (*ibid.*)

This conception of an actor-network differs from a structuralist emptying of the singular entity. It also differs from a humanistic view where autonomous agents are connected to each other in a network-like fashion. This view is presented by Collins & Yearly (1992b:375) who claim that “...all the powers lie with the people who make up the areas of density and those people’s concerted actions”. Actor-network is in agreement with the structuralist decentring of the autonomous humanistic individual. But, this decentred individual is not a mere function of the structure, because it is a potential actor-network. This notion of decentredness, as explained in the actor-pole in the quotation above, entails that the individual is not the centre of action, intention, consciousness or intelligence. The decentredness of ANT does, however, not mean that these qualities disappear, but they are seen as effects of networks.

One should not lose this account of the unity of the actor-network when the “network” and “actant” are discussed in the following two sections.

3.2. Network

It is important to distinguish ANT’s conception of network with that commonly used in notions such as the “network society” (Castells, 1996). In these conceptions existing, established and well-defined entities relate to each other as nodes in multiple relations. ANT sees actor and network as two sides of the same thing which cannot be broken into separate entities. Latour also warns against the concept of networks where pre-existing entities relate to each other through multiple bonds. He prefers, however, the name actor-network (Latour, 2005). In the words of Callon it entails the following:

But the actor-network should not, on the other hand, be confused with a network linking in some predictable fashion elements that are perfectly well defined and stable, for the entities it is composed of, whether natural or social, could at any moment redefine their identity and mutual relationships in some new way and bring new elements into the network. (Callon, 1987:93)

Although the suitability of the concept of actor-network has been debated in the ANT literature (see Law, 1999) such as Latour's (Latour, 1996c:303) discussion of various difficulties with the concept related to some technicist interpretations, it remains the most useful concept to describe what is intended.

Because of the ladenness of "network" Latour introduces the concept "rhizome" which refers to the unpredictable ways associations grow in all directions linking humans and nonhumans in heterogeneous networks. This notion of network is different from a structuralist understanding which presents a static and defined framework within which each entity receives an essence, function and place. It must also be contrasted to a postmodern view which breaks the whole up in unrelated fragments. The rhizome suggests that an element of continuity exists in the assembling of new entities. It is similar to Ciborra's (2004:22) notion of "drift" which refers to the unpredictable ways a system develops and that it is not determined by rational design or intentional actions (see also Monteiro & Hanseth, 1996:207). The metaphor of the rhizome also suggests that all associations in the network are localized in the sense that any one entity always links with another in a local way.

In his discussion of the nature of the network, Law (1990:120) contrasts it with the notions of "system" and "social construction". A network is for him closer to system because of the "objectivity" of the system in contrast to the "subjectivity" of something that is socially constructed. The network differs, however, from a system in so far as the system assumes a high level of centricist coherence and the degradation of the actors which make it up (Callon & Latour, 1981:297). A network is much more complex than a system because of its dynamism and because of the many ways in which entities could associate. It also differs from a system in so far as a system is seen to be clearly separated from its environment. The environmental or contextual factors which might impact on the network are actually part of and not external to the network. Law (1990) illustrates this by showing how the Portuguese vessel enrolls the wind and the sea currents in order to become a network. Since the network defines what is real, it could not be related to a larger context. Entities

become part of the network as actants in as far as they impact on the network. A network also differs from a system in the endemic presence of struggles. Whereas a system assumes stability, stability in the network is more the exception than the rule (Law & Mol, 1995:291).

The concept of a network is useful since it represents an attempt to capture the whole in a coherent way without, on the one hand making it a system, and on the other hand fragmenting it (Latour, 1996c). Although coherent, the network cannot be seen as a unity because of the inherent complexity of the entities which constitute it and which resist reduction to a single principle. The network is not a new synthesis of two or more opposing entities such as subjective/objective, nature/society, human/technical. In order to capture the network as a complexity, Law (1999:12) uses the term “fractal” to indicate that the network is “more than one and less than many”. It does not refer to two or more separated entities because they are all assembled in one network. The network is also not one because of the persistent internal struggles and the many ways in which entities are enrolled in the network. The collective is not a whole, but should rather be described in terms of “patchwork” (Law & Mol, 1995:287) or in terms of a pin board (Law, 2002). The “singularity” of a network refers to a forced process through which the interests of some entities are sufficiently translated in harmony with those of a dominant actant.

In opposition to the fragmentation of postmodernism, the tracing of the associations looks for the “constant” that is maintained through the multiple associations (Latour, 1996c:302; see also Latour, 1999b:58). ANT does not merely follow the actors and multiply the associations, but investigates the constants that tie the fragments together. Latour (1999a:20) refers to Mol & Law who describe the constant as a *fluid* in the network, or as the *regimes of delegation* (Latour, 1996c:302). In the process he wants to find and investigate the trajectories traced by the free associations. Law’s (2002) notion of a “pin board” attempts to show that many possible relations could be found between the different entities. The identification of such a constant is important to explain the coherence of the network in contrast to the postmodern fragmentation which does not make it possible to understand how a regime of power comes into being.

One example which illustrates different aspects of the actor-network, is Law's (1986, 1990) description of how a durable network is formed to enable the Portuguese galleys to successfully reach the Indies and to return to the port of departure. For this collective to be stable and successful, various heterogeneous entities have to be associated such as planks, sails, winds, currents, men, positioning instruments, stars, sun, moon and tides. The collective succeeds in remaining stable when the associations held against various elements (currents, storms) which attempt to disassociate them. Examples of failed networks are provided by Callon (1986a) who describes how the electric vehicle did not realise in 1973 and by Latour (1996a) who describes the *Aramis*³ project. These networks were unsuccessful because the entities failed to form durable associations.

The critique of Saldanha (2003:428) that ANT sees a network in an isolated way may be true of some ANT-based empirical studies. The methodology of ANT does, however, not limit the analysis to only one network. It is recognised within ANT that actants may belong simultaneously to different networks and may resist aspects of one network on the basis of its alliance to another. It is exactly because an actant concentrates the network to which it belongs in a singularity that it is seen as a candidate to be enrolled within another network for the sake of drawing on this stored energy. Networks could therefore stand in different kinds of relations with each other, ranging from being nested within each other to standing in direct conflict. Furthermore, the boundary of a network could be drawn in different ways depending on a particular perspective or interests.

Since it could never be predicted which entities will associate and what the effects of the association would be, the consequence for the researcher is that the network could not be fully described. Such a complete description would have to take all the views of the different actors into account. If this principle is applied to Callon's

³ *Aramis* is the name of the innovative but failed project in Paris to develop an electric vehicle which would combine the benefits of both public and private transport. The plan entails cars for up to four people which operate independently but travel on a track and couple with other cars to form a "train" and uncouple when the passengers wish to get off at a particular station. Latour (1996a) investigates the project as interlinking networks and traces the processes of enrolment and dis-enrolment which led to the eventual failure of the project.

(1986b) well known discussion of the scallops of St Brieuc bay, the views of both the scientists and the scallops have to be described (as commented on by Collins & Yearley, 1992a). It has to be acknowledged that limitations are necessary and arbitrary.

3.3. Actant

The terms actant and actor will be used interchangeably. Some authors prefer to talk about an actant (Latour) to avoid the exclusive connotation of humans as actors while others (Law and Mol, 1995) talk about actor, and about agent (Callon & Law, 1995).

The issue of (human) agency is central in all humanist sociologies which attempt to create a space for (human) volition, autonomy and freedom against what is seen as the constraining effect of structures. The need for a space for the human agent is expressed in opposition to structuralist sociologies which decentre human agency by seeing it as a function of structures. ANT attempts to overcome this irresolvable dichotomy of agency/structure by introducing the concept of actant. In doing this ANT attempts to avoid the debates about structure and agent and the ways in which one of them is privileged in sociological literature. The actant is not another form of the human agent and cannot be compared with the humanist concept of agency and is not meant to replace it.

This difference between actancy and agency seems to be overlooked by many critiques of ANT who states that it does not recognise the fundamental difference between humans and nonhumans. ANT does not take an *a priori* position on the nature of any entity but states that all entities (human or nonhuman) are products of a network. No entity could be understood if the network of which it is part is not analysed.

From the symmetrical perspective of ANT, sociological traditions could be read as attempts to identify different kinds of actants. Structuralism locates actancy in the underlying structures which causes the changes in society. Rationalism identifies underlying ideas or rational processes which affect society such as democracy, freedom or autonomy. Humanism and Constructivism locate actancy in the autonomous individual or group endowed with intentions and consciousness.

Objectivistic views, such as scientific realism locate actancy in the “laws of nature” or the actions of natural entities. ANT does not want to deprive any of these possible actants their of role, but uses a conceptual framework within which the functioning and effects of all possible actants could be interrelated and compared. The principle of symmetry already stated that an *a priori* distinction cannot be made between different kinds of actants in the study of networks. It is therefore possible in ANT that entities such as people, material things, technologies, ideas or natural events could all be actants.

Although any entity could be an actant, who/what the actual actant is, can only be established empirically. In order to establish whether something/body is an actant, a basic indicator of actancy should be used. In ANT something is an actant if it “makes a difference” (Latour, 2004a:68), if it has an effect (Latour, 2004a) or leaves a trace (Latour, 2004a:70) that could be established and described. An actor is “any element which bends space around itself, makes other elements dependent upon itself and translates their will into a language of its own” (Callon & Latour, 1981: 286). An actor is not merely an incidence of a law, a potential, or an “intermediary” which is not doing anything on its own (Latour, 2004a:72):

[A]n actor that makes no difference, in my vocabulary, is not an actor at all. An actor, if words have any meaning, is exactly what is *not* substitutable for anyone else; it’s a unique event, totally irreducible to any other. (Latour, 2004a:73)

It is not only humans that make a difference in the network, but also the wind (Law, 1990), microbes (Latour, 1993), strategies, ideas, or theories. It is important to emphasise that an actor is not just a human imbued with intentionality.

Humans may, but need not be, actors; and actors may, but need not be, humans. (Law & Mol, 1995:277)

An actor should not be equated with an individual and actancy not with the individual’s potential to act. Since relations are prior to individual entities, the network is the actant (Callon & Latour, 1981:280). There are no things by themselves, only relations “which sometimes make things” (Callon & Law, 1995:485). If an individual is identified as an actant, it must be seen as an effect of the network: “...agents are effects generated in configurations of different materials” within a network (Callon & Law, 1995:502). To say that actancy is an emergent property of a network means

that the network displays characteristics which the individual parts do not have. It also means that networks are not necessarily actants when they could fail to become durable.

ANT suggests that it is not useful to bring intentionality into the picture. While intentionality is already taken out of the definition of agency in structuration theory, ANT takes it further by saying that intentions cannot be traced to a purely human origin, but are also effects of a network. They are not stable or exist in a pure form in unassociated human actants. This notion of intentionality could be illustrated with reference to Introna & Whitley's (1997) example of the cash dispenser. Although this is not developed in their discussion, it could be indicated that the human intention to withdraw money and to buy dinner for friends is already shaped by the presence and functioning of the cash dispenser. The intention to buy dinner for friends might not even have arisen if the cash dispenser were not present. The human-cash dispenser network has intentions that are different from the human alone. This indicates that human intentions are the effect of a particular (hybrid) network. The actancy of the dispenser does not only appear when it fulfils (or fails to) its function, as suggested by Rose & Truex (2000:10), but it has already appeared when it becomes part of the human-cash dispenser network in which the intention to withdraw money arises.

No individual entity could act on its own because it needs to enrol the energy of other entities to have an effect. It is therefore only the actant within the network of enrolled entities which could act. The paradox of power (Latour, 1986) entails that the ability of the primary actant to act, is dependent on the powers of others enrolled in the programme of action. The decentredness of actancy therefore means that the centre of action lies outside the actant. Actors do not embody action or actantiality (potential for action) but it is their relational dimension that generates instances of action (Law, 1992). Actancy is a relational process where the initiator of action enrolls others in a program of action and where the energy of others returns to perform the action. Actantiality (or the possibility to act), lies in the circulation. Actantiality is not what an actor does,

but what *provides* actants with their actions, with their subjectivity, with their intentionality, with their morality. When you hook up with this circulating entity, then you are partially provided with consciousness, subjectivity, actoriality, etc. (Latour, 1999a:18)

Actancy could therefore not be attributed to either humans or technology, but to networks that are per definition hybrid entities. It is therefore not correct to attribute “material agency” to ANT (Jones 1999:294) because agency lies in the network which is never purely material. One can therefore not simply ask about the effect of a particular technology, such as *Lotus Notes* (Jones, 1999) but the way in which the technology becomes part of a network and what the effects of this new hybrid are. These effects cannot simply be attributed to characteristics of the technology (such as the speed of *Lotus Notes*), but could only be traced empirically to see how different kinds of translation and enrolment took place to create particular effects. The actor-network entails that action is circular and recursive since the initial actor is also affected and thereby defined and redefined. This continuous relational interplay is the performative characteristics of actor networks, where actors are in fact “performed in, by, and through relations” (Law, 1999).

The notion of an actant developed here does not deny the possibility that a particular entity, such as the manager, or a technology (Winner, 1993:371) may obtain certain autonomy by acting on its own and seems to exert power on others. Agency as attributions, are often localised as singularity which

endow one part of a configuration with the status of prime mover. Attributions which efface the other entities and relations in the *collectif*, or consign these to a supporting and infrastructural role. (Callon & Law, 1995:503)

The location of actancy in the network shows, however, that this autonomy is not an inherent property of such an individual entity, but it is relative to, and an effect of the network. Callon & Law (1995:489) show how the manager of a company is able to see, decide and act because a network of actants such as reports, a telephone, the internet, paperwork, a desk and a secretary create a discretionary space, the capacity for choice and intentions. The hybrid collective creates discretionary spaces and agency/strategists are attributed to specific places in the network (*ibid.*, p.496). It illustrates that power is not a possession of an individual, but the effect of the network. It therefore appears as if actancy is localised within a particular individual seen as the prime mover imbued with intentions and strategies.

For this is the argument: it is plausible to say that Andrew is able to act as a strategist because there is a *collectif*, a *collectif* of materially heterogeneous bits and pieces. Because there is a *hybrid collectif*. (Callon & Law, 1995:489)

It is important for ANT that the “bias” towards attributing agency to a single point (singularity) should be overcome in order to recognise the location of agency in a network (Callon & Law, 1995:499). For Law (1986:255), “power is the function of the capacity to muster a large number of allies at one spot”.

The network is characterised by conflict, power struggles, marginalisation and exclusion. Although all actors are the same, they are not of the same size. The growth in size, or the concentration of actancy in a single entity is the outcome of a long struggle and leads towards asymmetry (inequality) and the production of the macro-actant (Callon & Latour, 1981:287). Actors become bigger by enrolling others in their plans of action and by multiplying their associations. In the process it becomes a larger actor-network. It is clear then that “agency” in ANT is the property of a complex hybrid as argued by McMaster & Wastell (2005).

The difference between actants is therefore an effect of this network (Callon & Law, 1995:502). Callon (1986a) illustrates this with his account of the struggle between the electric vehicle (VEL⁴) and Renault where VEL attempted to enrol Renault in its network. Renault resisted this enrolment successfully by associating with other entities and thereby strengthening its own network. The result was that VEL disappeared as actor-network because it could not make a difference any more and Renault remains in the position of a macro-actor.

Actancy is important in ANT because it provides the basic entity behind the establishment of networks. The creation and maintenance of networks are always an active process. No entity is the deterministic effect of any other because its own powers have to be enrolled in the process. No network is the product of global factors or theories, but is performed locally. The focus on the actant reveals how this particular network came into being and how it is being maintained.

3.4. Heterogeneity

Heterogeneity does not merely refer to the common notion that humans and machines function closely together in formal and informal contexts, or that machines

⁴ VEL was the name of the innovative project in France which attempted to develop an electric car in 1973.

might take over human functions, but to the more radical claim that both humans and nonhumans participate as actants in the constitution of the collective and that the boundary between them could not be drawn clearly and definitively. Latour (1999b:200) describes the close relationship between different kinds of entities as follows:

If there is one thing of which we may be as certain as we are of death and taxation, it is that we will live tomorrow in imbrolios of science, techniques, and society *even more tightly linked* than those of yesterday...

The close relation lies in the ways humans and nonhumans exchange characteristics and share properties in the processes of association. Both kinds of entities are socialised into the collective and contributes to its expansion (Latour, 1999b:204). They both play an active part in the processes of association, translation and enrolment. Law (1986:251) indicates, for example, that the durability of the Portuguese expansion is dependent on the different “*types of elements that they brought together in their system*”. These human and nonhuman elements were not merely passive instruments, but played an active part in the constitution of the network.

The principle of heterogeneity means that no *a priori* distinction could be made between entities traditionally classified as different in kind such as human and nonhuman. This is a consequence of the principle of symmetry which requires of ANT to go beyond the well-established, and in many ways commonsensical, categories. No category could be taken as “natural” or part of the “order of things” but should be seen as the effect of a network or of a combination of networks. The traditional categories should be seen as “macro-actants” whose genealogy should be traced. What is regarded as human or nonhuman is not inscribed in the order of things, but is an effect or outcome of particular networks which produce certain classificatory schemes. Every entity is subjected to a continual process of change in relation to the other entities it encounters and the networks in which it is enrolled. Whereas essences about entities are historically established outside and prior to their entrance into the collective, for ANT it could only be established inside and by the collective. No essences exist outside the process of negotiating their way into the collective. It is therefore meaningless to attempt capturing or rescuing the “uniquely” human “uncontaminated” by machines because what we regard as human is already

a hybrid. ANT does not separate the human from the nonhuman, but shows how they move closer together (Latour, 1999b:200).

Because of this heterogeneity neither the human nor the nonhuman could be seen as the actant which shapes the network “in the last instance”. We have seen in the previous section that actancy is distributed between different kinds of entities in the network. Although it remains in principle an open question, who/what the ultimate actant is could always be established in an empirical way in any particular network (Law, 1992:382). In this way ANT differs from social constructivism where the human agent is the final, determining one, and from structuralism which attributes ultimate actancy to objective structures or to things. From the perspective of this heterogeneity where an active role is attributed to nonhumans, it is not accurate of Winner (1993:366) to classify ANT with the SSK as both social constructivists.

All categories which are based on distinctions and produce identities are network effects and not part of a necessary “natural” or “social” order. This leads Law (1992:389) to describe the basic principle of ANT as “relational materialism” since it treats “different material – people, machines, ‘ideas’ and all the rest – as interactional effects rather than primitive causes”.

This is the basic argument to the extent that “society” recursively reproduces itself it does so because it is materially heterogeneous. And sociologies that do not take machines and architectures as seriously as they do people will never solve the problem of reproduction. (*ibid.*)

The concept “social” does not only refer to purely human associations, but it also includes the various kinds of associations with “nonhumans” with which these humans stand in a relation. The concepts “social” and “actor-network” now refer to the same processes of assembling. ANT takes it as a humanist bias to limit the social to human relations. In order to understand the social order, the *active* role of nonhumans must be taken into account. In this way ANT provides a new perspective on the blend of humans and nonhumans by analysing in detail how they make up a composite.

In the light of this conceptual framework of ANT, the critique (of *i.a.* Collins & Yearley, 1992a & b) that ANT does not take the difference between humans and nonhumans seriously, is not well founded. This critique of Collins & Yearley (1992a & b) alludes to what Law calls the “monstrosity” of the networks. From the perspective

of the purity of the dualisms where the two poles are kept apart, the hybrid network is a “monster”. The “hybrid collectif” (Callon & Law, 1995) refers to the way (what is later regarded as) different kinds of entities play similar and interchangeable roles in the composition of the network. It is because of its lack of purity that the collective is seen as “monstrous”. The notion of monstrosity suggests something that is big, threatening and beyond understanding. The difficulty to grasp the monster relates to the inability to fully describe it with the use of known metaphors. “It is at the same time machine, market, code, body, and war” (Callon & Latour, 1981:294). The monstrosity is further indicated by the fact that we humans are entangled in many such hybrid networks. The monster seems to threaten human nature because it intermingles humans and nonhumans in a way that blurs the distinctions. The fear is the monster will destroy human nature, freedom and autonomy. The heterogeneity of any network implies that the monsters are not out there in the form of machines, but that we are all “monsters”.

ANT demystifies the notion of “monster” by showing that all networks are heterogeneous. This realisation trades the us/them divide that the concept of a monster reinforces, for an expanded “us”. In this way the close link between humans and nonhumans and the fluidity of the boundaries are acknowledged. The concept “monstrosity” also refers to the need for a critical perspective which questions the categories and divisions. It also indicates the different ways in which actancy appear. It is therefore important to realise that

... there are multiform kinds of agency: forms of agency that we can't imagine; forms of agency performed in patterns of translation that are foreign to us; forms of agency that are, for instance, nonstrategic, distributed, and decentered. (Callon & Law, 1995:503)

This is a crucial finding if the kind of actancy technology exercises is investigated in the next chapter.

But it insists that social agents are never located in bodies and bodies alone, but rather that an actor is a patterned network of heterogeneous relations, or an effect produced by such a network. (Law, 1992:384)

3.5. *Ontology*

ANT develops an ontology that is experimental, relational, realist and non-essentialistic. It finds a space where the dichotomous ontologies of empiricism, constructivism and postmodernism are overcome. It wants to be empiristic without taking the empirical at face value and constructivist without the relativism of social constructivism. It wants to move beyond the discursivity of postmodernism by showing how texts and reality relate. Latour develops an approach which recognises the relativity of knowledge as well as the existence of a reality which is not simply the product of ideas.

The main problem with postmodernism and constructivism is that they replace the objective reality of entities with ones that are either social constructions, products of discourse, signs or texts. The only reality for the postmoderns is the reality created in the text. The same denial of an objective reality takes place within constructivism. The social is taken as given and as the origin of science or technology. In the social constructivist views science and technology are nothing more than a product of a particular society. Latour (1993:26) finds the Strong Thesis in the Sociology of Science inconsistent because they relate the natural sciences to their social conditions, but exempt sociology from such a reduction, and thereby exempting themselves from the brunt of critical reflexivity. They do not show how the sociology of science is socially determined. The society which provides the conditions for all the sciences is not subjected to the same constructivist critique, but is unproblematically taken as the source of science or technology. The STSS is inconsistent because a constructivist view is applied to the sciences and a realist view is held of society. The same critique could be levelled against technological constructivism which sees technology as a social construction and society as existing before and independent of technology. While deconstructing technology in relation to its social origins, they take society itself unproblematically as the origin of the ideas.

Latour's critique of constructivism does not mean that he reverts to a naïve form of empiricism where natural entities speak for themselves without the mediation of others. For Latour, this form of realism makes of natural entities "matters of fact". This refers to objects presenting themselves unproblematically and unmediated and

independent of human intervention. Since natural entities are seen to exist objectively in this view, science merely records, discovers and approximates them. For Latour, the “matter of fact” cannot fully capture what is “out there”.

The question is that matters of fact are a poor *proxy* of experience and of experimentation and, I would add, a confusing bundle of polemics, of epistemology, of modernist politics that can in no way claim to represent what is requested by a realist attitude. (Latour, 2004c:245)

Latour’s critique of naïve realism does not, on the other hand, mean that he reverts to a form of social constructivism. Where the realists postulate the existence of “facts”, the constructivists see it as “fiction”, the product of the social. The objects of science are, for Latour, not a matter of fact or fiction, but a “matter of concern”.

Through various studies Latour traces

their birth, their slow construction, their fascinating emergence as matters of concern. (Latour, 2004c:242).

The close study of Pasteur’s microbes shows how the careful construction of facts establishes reality and objectivity. Latour coins the concept “factish” to refer to what is neither pure fact, nor fiction:

The factish suggests an entirely different move: it is *because* it is constructed that it is so very real, so autonomous, so independent of our own hands. (Latour, 1999b:275)

The “matter of concern” does not only refer to the simultaneous discovery and construction of entities, but also to the ongoing effort to maintain the reality of these entities. It cannot be seen as a process through which facts are socially constructed or as a process where facts are objectively registered by passive scientists.

Objects are much too strong to be treated as fetishes and much too weak to be treated as indisputable causal explanations of some unconscious action.

Once you realize that scientific objects cannot be socially explained, then you realize too that the so-called weak objects, those that appear to be candidates for the accusation of antifetishism, were never mere projections on an empty screen either. (Latour, 2004c:242)

Latour wants to develop a form of realism which is not naïve in the sense that objective entities exist by themselves. His study of Pasteur’s work indicates how microbes came into existence. It was not simply a discovery of something out there, nor was it an arbitrary decision by scientists. As a matter of concern it slowly came into existence through the process of gathering.

Of all the modern philosophers who tried to overcome matters of fact, Whitehead is the only one who, instead of taking the path of critique and directing his attention *away* from facts to what makes them possible as Kant did; or adding something to their bare bones as Husserl did; or avoiding the fate of their domination, their *Gestell*, as much as possible as Heidegger did; tried to get *closer* to them or, more exactly, to see through them the reality that requested a new respectful realist attitude. (Latour, 2004c:244)

Latour argues that the more scientists construct facts in the laboratory, the more real these entities become. Pasteur's microbes were neither constructed nor discovered in the laboratory, but they came into being through laborious processes of association and translation. In this way reality comes about through the slow process in which entities find their place in the network through associations. Reality is therefore not something "out there" (objectivistic), or something "in here" (subjectivistic, relativistic), but a network as a construction.

Related to technology, this ontology affirms both the construction and reality of technological entities. The same process of reality-building failed in the case of *Aramis*.

A technological project is neither realistic nor unrealistic; it takes on reality, or loses it, by degrees.

So can we say that nothing is really real? No. But anything can become more real or less real, depending on the continuous chains of translation. (Latour, 1996a:85)

Reality is therefore not an attribute of things, but it is a slow process through which the associations become more and stronger. *Aramis* did not become real because the enrolments and translations could not hold. This view of the construction of reality makes it now possible to acknowledge the independent world out there without falling into an objectivism where the objective world is ready for discovery and dictates belief and behaviour through its unchanging laws. It is also possible to acknowledge the constructions of scientists without making knowledge a social construction. An objective reality grows through the efforts of, *i.a.*, technologists and scientists.

Although ANT's ontology is constructivist, it is not a form of social constructivism because an objective reality is the outcome of the networking processes and because nonhuman entities also play a role in the construction process. The building of a network is the building of reality. Cordella & Shaikh (2003) state: "so in a sense

reality becomes 'real' when actors interact". In Latour's (1996a) discussion of *Aramis* the system of interconnected semi-private electric vehicles did not become reality because a stable and enduring network could not be assembled. In contrast, Pasteur's (Latour, 1988a) microbes were real because they were successfully enrolled in his network. Reality is not something outside the network with which it relates and which it refers to or represents. A network does not have to be contextualised in order to place it in a larger reality. An entity could only be regarded as "real" if it becomes part of the collective. The collective consists of everything regarded as real and which is named and distinguished in categories such as "humans", "scientific objects", "technologies", "procedures", "laws", "animals", "nature". No entity could be real outside associations.

The idea that reality is the product of the network makes the process of creating reality open to participation by heterogeneous entities. The microbes became important social actors affecting the collective as could be seen in the impact its reality had on terrains such as the economy, politics and the health sector (Latour, 1988a:268). Science and technology play an increasingly important part in the construction of reality since they are instrumental in the proliferation of new entities and enable their inclusion into networks. Multitudes of new entities which are consistently "discovered" by science or "designed" by technology expand and impact on networks in significant ways.

It should be clear that reality is not a static entity since it grows or shrinks. The notion of "experimental ontology" refers to this process of continual establishing, expanding, reducing and testing what is real. Reality is always under construction. Reality is added when more entities become part of the collective or subtracted when entities are excluded. Entities come into existence through the multiplicity of their relations and lose reality if they get disconnected. Ontology is therefore relative to the relations within the network. The experimental nature of ontology lies in the many trials of translation and enrolment through which the reality eventually appears. It also refers to the contingent nature of any state of reality which could always have been otherwise. Reality is not what is necessary and inevitable. The realism of this ontology relates to the establishment of something that is objective and independent from any particular entity that contributed to it. What is regarded as real, is an effect of the collective.

Against this background of ANT's ontology, it is possible to evaluate some of its interpretations. Cordella & Shaikh (2003) argue correctly that ANT has largely been used in ISR as an interpretivist tool. They argue, however, that the ontology of ANT is different from interpretivist ontology. They show that it is not a typical interpretivist ontology which is created from interpretations, but an ontology which emerges through the interplay between different actors. In relation to the reality of technology, it is wrong of Jones (1999:294) to expect that ANT should be in agreement with Grint & Woolgar's "textual approach" according to which technology is text. The implication of ANT's ontology is that technology is real and that one could talk about its "inherent features" or the volition of technology. It is also not true that ANT is ontologically relativist but empirically realist (Lee & Hassard, 1999) because there are for ANT not many different and incompatible realities as such. The fractal nature of any object refers to its coherence and complexity.

The ontology of ANT is non-essentialistic in that no fixed and substantial identity could be attributed to any entity. What Law & Mol (1995:277; also Law, 1999) call "relational materiality" refers to the idea that all entities are relational effects of the network and that nothing exists by itself:

All are interactive products. This is the case with materials, technologies, people who have no reality outside their interactions. Even Pasteur is "relational effect". (Law & Moll, 1995:277)

Although there are no essential identities such as human nature or technology, all entities are not the same. ANT is centrally interested in the differences between entities, but sees these as network effects which must be traced. ANT does not deny differences, only that such differences could be established *a priori*. We cannot establish the difference between humans and machines in universal definitions prior to analysing the networks within which they exist. The boundaries we perceive between humans and machines are not stable as illustrated by Bloomfield & Vurdubakis (1999).

The fact that no essential identity exist in ANT, does not mean, on the other hand, that an entity is fully constituted by its relations. According to Harman (2007:163) Latour's relationalism entails that an "actor is completely actualized in any moment, inscribed without reserve in its scheme of alliances". Latour (LSE, 2008) refutes this with reference to his notions of irreduction and realism. He defines an actor as "a

unique event, totally irreducible to any other” (Latour, 2004a:73). The key statement regarding the notion of irreduction states:

Nothing is, by itself, either reducible or irreducible to anything else. (Latour, 1988a:158)

While avoiding any notion of essentialism which states that an unchanging essential identity exists inside every entity, Latour makes a negative statement by claiming that no entity could be reduced to any other. One implication of this is that no entity could be reduced to its relations with others. It does not mean that a core, substantial identity escapes these relations. The essentialism ANT wants to avoid is one where such a substantive identity is postulated and used to explain radical difference. The notion of “irreduction” does not claim a positive identity, but states it rather negatively.

The connotation of a “flat” ontology (Walsham, 1997) is true because ANT does not recognise a platonic true or higher reality behind the appearances. To be real is to be connected on the same flat plane. Entities could be more real if they are more connected in networks. This does not take away the fact that reality is infinitely complex and layered.

Since the building of networks is also the construction of an objective reality, ANT could not be called “semiotic” in the sense that it consists of words connected to each other, or a system of signs (Collins & Yearly, 1992a:303). Meaning is established through relations, but these relations include entities other than what is found in the text. They include the entities discovered/constructed in the laboratory, or in field studies. Such a semiotic view of ANT would deprive it of the ability to be critical since there is “no purchase for sceptical levers to shift the world on its axis” (Collins & Yearley, 1992a: 303). Through a notion of reference the relation between words and “things” are explained. Words do not stand outside the things they refer to, but also constitute those things. Where semiotics finds the identity of entities in the difference of their relations, ANT wants to go further than the interplay between signs. In a similar way, it is not correct to see ANT as a form of (social) constructivism (Cordella & Shaikh, 2003:5) since it takes a reality outside human constructions seriously.

4. Politics of the network

The assembling of a network is a strategic and powerful process. The effect of power is visible where identities are shaped, interests changed, entities mobilised and enrolled. It is central to ANT to identify and follow the processes through which the collective is assembled. The politics of the collective refers to the ways in which power is accumulated and distributed in the establishment and maintenance of collectives. It refers to the continual struggle where entities are enrolled, changed and excluded. The politics of the collective traces how the macro-actor gains and maintains power through others.

The politics of the collective is not limited to the terrain of human interaction and association, such as the social contract (Rousseau, 1762). The processes are also not only verbal and discursive because humans and nonhumans represent their strategic positions also in a non-linguistic and non-discursive ways. The multiple ways in which power is translated (and changed) from one entity to the other is not recognised if only human actors are considered. These other entities are potentially powerful contributors to the politics of the collective although we do not always understand properly how they operate, or recognise what they do.

Instead, it seems to me that these Others will ignore us for most of the time. Instead, they will continue, as they always have, to perform their specific forms of agency to one another. (Callon & Law, 1995:504)

The monistic “grammar” of ANT makes it possible to trace the heterogeneous networks and to bring the role of these Others into play. In this section the political processes through which the collective is constituted, are explained in order to understand exactly how actants become powerful. This understanding is a necessary condition to start investigating them critically.

4.1. *Programme of action*

The successful assembling of the collective is guided by a strategy or plan of action in which the initial actor enlists the power of others. The plan of action contains a script according to which roles and trajectories are delegated to other actants (Latour, 1996c:296). Although a plan of action is essential, it usually changes in the processes of network building. Because of the decentredness of the actant and the

distributed nature of intentions, the plan of action could not always be attributed to any actant. Although the initial programme of action may undergo various changes as the network spreads and as multiple mediations and translations take place, a programme could always be discerned. The plan of action is not necessarily the intention the initial actor might have had before the processes of assembling. The intention can also not be read back from the outcomes of the collective. This diffusion of the plan of action is well captured by Ciborra & Hanseth's (2000:1) notion of "drift" which describes how organisational development is not rationally and intentionally controlled, but that there are "discrepancies between initial goals, visions, plans, and models, and the actual outcomes". Similarly, Hanseth & Monteiro (1997:207) show how the process of the setting of standards in an information infrastructure had unintended consequences "such as when the end-user input and practical experience was down-played ..." They conclude that "no one had a clear sense of the complexity of the actor-network" (*ibid.*).

One reason for this drift is that a programme of action always stands in an oppositional relation to "anti-programmes" which undermine or divert it. Latour (1988b) provides an account of a hotel manager who wants residents to hand their keys in at reception. In order to execute the programme of action and to counter the residents' anti-programmes (such as their forgetfulness), a notice, or a weight on the key holder are enrolled. The anti-programmes do not only relate to the drift, but also to the complexities of such a programme of action (see Chapter 5, Subsection 4.2).

It is not a necessary element of ANT that a dominant or focal actant and a clear programme of action are present. The examples discussed above gave rise to a critique of managerialism in ANT (Haraway, 1988; Law, 1994). Although a plan of action could always be found, it is often diffused and diverted. A different focal actor could also be identified depending on which relations and effects are prioritised in an investigation.

4.2. Social processes

The collective consists of various heterogeneous entities closely associated with each other and aligned in relation to a programme of action. ANT identifies the following processes through which networks grow: The basic processes are those of

association and *translation*, while the more specific processes of translation that operate in a cyclical way are *problematization*, *interessement*, *enrolment* and *mobilisation*.

The concept *association* indicates the central process in the network and replaces the binary processes of dialectics and synthesis in other sociologies. Association does not assume the pre-existence of opposing entities between which a dialectical relation could exist or which could be synthesised into a whole. Association refers to the way different entities (both human and non-human) interchange and transfer qualities and competences. Through association an “indissociable” link is made between two entities who become one (Callon & Latour, 1981:293). An association is a “trial of strength”, an attempt to force a relation between different entities through enrolment and translation (Latour, 1988a:158).

Through associations, entities interchange characteristics and develop new ones. Associations do not develop according to a predefined plan, but grow (and decay) in unpredictable (rhizomatic) ways. Associations can always be traced to the specific entities involved. This is not a phenomenological approach which attempts to uncover the “things in themselves” because entities do not exist separate from associations. The process of association is one where the entities themselves are constituted. Entities do not exist before the associations but come into being through associations. Latour (1996c:303) expands on Sartre’s (1947) principle (“existence precedes essence”) by saying that “essence is existence, and existence is association”. The focus on associations does not limit ANT to the micro-terrain of individual interaction, but provides the key to relate the micro- with the macro-terrains.

Association entails the process of translation which takes place when a characteristic or competence is transferred from one entity to the other.

By translation we understand all the negotiations, intrigues, calculations, acts of persuasion and violence, thanks to which an actor or force takes, or causes to be conferred on itself, authority to speak or act on behalf of another actor or force. (Callon & Latour, 1981:279)

During the process of translation

[t]he identity of actors, the possibility of interaction and the margins of manoeuvre are negotiated and delimited. (Callon, 1986b:203)

Through translation new entities are related to each other and interchange their characteristics and competences, such as when the speed bump obtains qualities of a policeman, or the automatic door groom obtains qualities of the human groom (Latour, 1988b). Translation is the circular process of "interpretation" or as Callon (1991) puts it, the "definition" that every actor makes of other actors in the actor-network. Translation is not only a verbal process, but a process of representation which could also take place in nonverbal ways. Translation is when one entity stands in for the other. It is not only the process where one text is made equivalent to another, but one where entities are related.

The world of meaning and the world of being are one and the same world, that of translation, substitution, delegation, passing. (Latour, 1993:129)

Translation also refers to programmes of action which are shifted from one translation to the other in the attempt to enrol actors, align interests and ensure irreversibility (Latour, 1991, 1994, 1995). The translation may also entail a shifting out to another medium such as when an action is transferred to a machine. Latour's (1991) example of the hotel manager, who wanted residents to hand in the key at reception before leaving, could be used to illustrate the processes of association and translation. The reluctant resident has to be persuaded not to carry and lose the key, but to leave it at reception. In the process the manager translated one association to the other in order to execute a plan of action. The manager's initial attempts to convey verbal requests, demands and threats did not work. This failing, the programme of action is translated into another medium by adding weight to the key to remind tenants to hand it in at the reception desk. The verbal command is shifted to a physical weight. This also happens when the command to slow down is shifted to a speed bump. Faraj *et al.* (2004) demonstrate how certain beliefs about technology are translated in terms of the interests of others in order to enrol them in the growing network of web browsers. Latour explains that translation consists of a horizontal and vertical element. The horizontal element of translation refers to the addition of new entities and the vertical element to the replacement of one programme of action with the other.

Translation may appear equivalent, but always shifts meaning and identities. The process of translation requires a spokesperson that is speaking on behalf of the

other (Callon, 1986a:24). Translation may be unsuccessful when the attempt to transfer the characteristic or competence fails.

Translation becomes treason, *tradutore-traditore*, once an enrolled entity refuses to enter the actor-world in order to expand into others. Since entities are not easily translated, the destiny of most spokesmen is thus to be brutally contradicted. (Callon, 1986a:25)

Callon (1986b) identifies four moments of translation: problematisation, *interessement*, enrolment and mobilisation. Problematisation refers to the identification of a problem as relevant and legitimate to all participants. A problem “designates obstacles that are thrown across the path of an actor which hinder his movement” (Callon, 1986b:228, note 27). It might refer to the problem experienced by the fishermen at St Brieuc Bay whose harvest of scallops declined (Callon, 1986b; also Callon, 1986a:26), or the problem of the farmers in France whose cows died of an unknown disease (Latour, 1988a), or of the commuters in Paris who wish to get to work without being caught up in heavy traffic (Latour, 1996a). Problematisation consists of the definition of the identities of the relevant entities by describing their interests and anticipating how these interests might be served.

The way the problem is identified by the initiator is not necessarily the same as how others see their problems. It is therefore necessary for the initiator to convince others that this particular definition of the problem actually captures their problem, and that by solving this problem, they would also solve their own. If successful, the problem as defined by the initiator becomes the “obligatory point of passage” (Callon, 1986b:206) which others must accept and through which they must go in order to find a solution to their own problems.

The word “inter-esse” contains the element that the first actor comes in between the other actors and their interests or problems. In this process a shift takes place in the way the initial problem and goal were defined, and in relation to the identity of the actors. For this to happen the other entities are disassociated from their own prior attachments. The *pasteurisation* of France meant that the problems farmers and veterinarians experienced in relation to virus-infected cows could only be solved through the problem as identified by Pasteur in his laboratory (Latour, 1993).

Interessement contains the element of translation because the problems/interests of others are translated in terms of the problems of the first actor. The process of

problematisation and *interessement* are not necessarily successful since entities could resist these attempts by defining their interests and identities differently.

Whereas the process of *interessement* divorces entities from their existing associations and interests and provides them with new associations, enrolment refers to the allocation and fixation of roles. It refers to the successful problematisation and *interessement* where entities accepted their new identities and associations. Through these two processes, the different interests are aligned and different entities associated. Enrolment is only successful when physical or social displacement takes place, such as when an entity is displaced into a different form (Callon, 1986a:27). Any possible strategy could be used to ensure successful *interessement* and enrolment such as force, negotiation or cunning. A network which fails to enrol results in “separate spaces with no common measure” (Callon, 1991).

The last moment of translation, mobilisation, refers to stabilisation of the network. The network could only be stable if those successfully enrolled represent all the others that were not directly involved. Are the few the true spokespersons of the masses? If so, then the masses have been mobilised behind the voice of the representatives. If not, the network has failed to become a reality. In the case of Callon’s investigation, the question is whether the scientists are the true spokespersons of the scallops when presenting their case at academic conferences. Could the support of all those that are represented be counted on? This could only be established if a large enough number of scallops anchored themselves to the collectors in the bay. It is clear that mobilisation is dependent on a long chain of translations and displacements where the scallops in the sea become represented in graphs and tables on paper. Once mobilised, the identities of the entities became fixed in the creation of a social and natural reality (Callon, 1986b:218).

4.3. Change and order

Change and order is not only a central concern in sociological theories, but also in the development of critique. Neither of these two is “natural” processes, but each requires particular investments of power to achieve. From the previous sections we can see that successful enrolment and mobilisation make the network stable through the alignment of interests. Change could be described in terms of translation and

stability is associated with enrolment and mobilisation. Order is achieved when translation lasts, when interests are successfully translated and aligned. Law (1992:387-9) identifies four strategies which make translation lasting:

a) The stability of the network is related to the extent in which power is translated in durable ways through material entities.

Thus a good ordering strategy is to embody a set of relations in durable materials. (Law, 1992:387)

b) While durability refers to the ordering through time, mobility refers to the ordering through space. The “immutable mobiles” refers to those ordering devices that could be carried in an unchanged way from one place to the other.

c) “Translation is more effective when it anticipates the responses and reactions of the material to be translated” (*ibid.*, p.388). Translation is, for example more durable if the reactions of the users of an information system are successfully anticipated and made part of the translation process.

d) The existence of similar strategies of translation within and across networks such as “administration” or “vision” “which operate to generate complex configurations of network durability (*ibid.*, p.389).

From these strategies that operate in durable networks, it is clear that the stability of the network is not a given, but a particular effect of a complexity of processes. Order is also ensured when interests are closely aligned and when a network is simplified. Although one entity cannot be reduced to another, “everything may be made to the measure of everything else” (Latour, 1993:158) through the process of translation. A powerful ordering takes place when a network succeeds to draw on the energy of the entities it has aligned. The alignment of interests is harder when entities are complex because of their membership in different networks.

Once different entities are aligned, the network draws on their power. Behind such entities are networks of associated entities from where they draw their power and which it summarises. “But each of these entities enrolls a mass of silent others from which it draws its strength and credibility” (Callon, 1987:96). When an entity is enrolled within a network, it carries with it the power it has collected through its original networks.

In order for entities to be enrolled into and to become part of another network, they need to be simplified through translation, or black boxed (Callon, 1987:94). As such it does not deserve any further attention because it fulfils its function in silence.

A black box contains that which no longer needs to be reconsidered, those things whose contents have become a matter of indifference. The more elements one can place in black boxes – modes of thought, habits, forces and objects – the broader the construction one can raise. (Callon & Latour, 1981:285)

A black box is none other than a network concentrated or “punctuated” into a representative. The representative conveys the interests of the represented in a selective way. In the case of VEL, the engineers reduced the whole town to the city council which represents it. By enrolling the latter, the former is also mobilised (Callon, 1987:94). Simplification entails a selection and privileging of certain elements and the neglect of others. It is therefore not only single entities that are enrolled, but networks that were punctuated. The associated networks contribute then to the growth of the network through the nesting of networks, or the network of black boxes (Callon, 1987:95). The power of a macro-actor increases in so far as black boxes could be piled on each other.

The simplified, enrolled entities are juxtaposed to others in the association of the network (Callon, 1987:95). Such entities such as men, planks and the wind do not share any common characteristics before their enrolment and juxtaposition in a network (Law, 1990). The juxtaposition enables characteristics to be transferred and shared and new properties and competences to emerge. It is therefore possible for the new network to benefit from the accumulated resources from another.

Simplification is also a pre-condition for the growth of a macro-actor itself. This actor is less complex than the micro-actors from which it draws its strength (Callon & Latour, 1981:299). Monteiro & Hanseth (1996:336) illustrate this principle in relation to an information infrastructure. The larger the network, the harder it is to align all the different elements (Monteiro & Hanseth, 1996:337).

The network only holds if the processes of translation, enrolment are successful. In the case of VEL, the electrons, catalysts, industrial firms, consumers must all be kept in place (Callon, 1987:93). This is very difficult to achieve since

...no actor is so powerful that its decisions and associations as a whole will be finally and definitely considered as technical reality. (Callon & Latour, 1981:298)

Although they appear sealed and tight, the black boxes which make up the network of the macro-actor are always leaky in the sense that they do not accurately translate the interests of those they represent. Continued care must therefore be taken to maintain the network. It cannot be taken for granted that, once the network has been established, it will remain so indefinitely.

The constitution of the collective inevitably entails the exclusion or externalisation (Latour, 2004b:122) of certain entities. Exclusion is a necessary element of the constitution of the collective in order to fulfil the processes of hierarchy and institution (see Chapter 6, Subsection 7.2). Organizing necessarily implies “displacement” (Bloomfield & Vurdubakis, 1999:627). It is the very process of exclusion which makes the collective possible (and pure). The implication for the excluded entities is that reality is not attributed to them as is the case with many experimental objects and technologies that do not make it into the collective such as *Aramis* which remained a design and a memory. However important the process of exclusion is for the constitution of the network, it is never final because entities come back to make a new appeal to the collective for entrance.

A form of exclusion is also present in Law & Callon’s (1994) indication that the separation of an “inside” from an ‘outside” as a necessary condition for the stability of a socio-technical system. The inside is positioned as the obligatory point of passage for any entity who wishes to become part of the network. Because of the “interpretive flexibility” of any system, the possibility of different interpretations is countered by “disenfranchising” the sceptics or by transforming outsiders’ perceptions and by enrolling them (*ibid.*, p.299). Although Star (1991) complains about the way in which McDonalds discriminate against those allergic to onions, such exclusions are necessary for the stability of the network.

Power plays an important role in the stability of the network.

For actor-network theory is all about power – power as a (concealed or misrepresented) *effect*, rather than power as a set of causes. (Law, 1992:387)

Since the collective is never fixed once and for all, but requires continual maintenance, the same process needed to establish the collective are also needed to maintain it. The processes of networking must continually be performed since a network is not propelled through its own inertia. Many entities and procedures need to be kept in place to maintain the network. This point can be illustrated with Latour's account of power.

Latour (1986) contrasts a translation and a diffusion model of power. The diffusion model sees power as originating at a certain point and spreading with its own inertia throughout the organisation. The sovereign power of the king giving an instruction is the cause of the obedience of those that carry out the instruction. Power is here a possession or inherent ability. In the translation model of power, power has to be renegotiated at every point where it is to be obeyed. Since power is not a possession, the sovereign draws on the power of others to execute a command. The power of the initiator is therefore dependent on the power of others to carry the command forward. In the process translation of the initial command takes place on the basis of the interests of the translator. The sovereign is therefore dependent on others to exercise the power. The consequence is that multiple opportunities for breakdown exist along the line. Since processes of translation are always involved the command is never carried forward in exactly the same way it is given. It is mediated and distorted through the interests of others. If we accept this notion of power, then society is performed through everyone's efforts to define it (*ibid.*, p.273). The powerful are those who redefine what holds everything together. Power is the consequence of enrolling, convincing and enlisting. The powerful obtain and maintain their position by enrolling others in their programmes of action, by boxing them in, by misrepresenting them, and drawing from them.

"Strength thus resides in the power to break off and to bind together. More generally, strength is *intervention*, *interruption*, *interpretation* and *interest* as Serres has so convincingly shown. (Callon & Latour, 1981:292)

The composition of the network is still "the war of all against all". The winner is the one who

is able to stabilize a particular state of power relations by associating the largest number of irreversibly linked elements. (Callon & Latour, 1981:293)

5. Conclusion

ANT should firstly be seen as an empirical-analytical approach to the study of any network with its basic claim to merely “follow the actors”. The basic construction that ANT works with is that of the actor-network which is used to describe and analyse any entity such as an organisation or a technological artefact. This chapter described the notion of an actor-network, the characteristics of these networks and the processes through which the networks come into being and are maintained. The network could be seen as a regime of truth and power within which identities, functions, meanings and values are defined and distributed.

Since the analysis of the network is already part of critique, this chapter already suggests some of the strategies and purposes of critique. On the basis of this, Chapter 5 investigates the distinct nature of technology and what kinds of roles it plays in networks. This is contrasted with the conceptions of technology in Chapter 3. ANT avoids the allocation of an essential nature to any entity, but also wants to be in a position to distinguish different entities.

ANT and technology

1. Introduction

A more detailed account of technology is now possible against the background of the general account of ANT in the previous chapter⁵. It consists of a general description of various aspects of technology and an account of the specific role of the technological within the network and particularly the relation between the human and the technical. In the previous chapter it was described how the heterogeneous network comes into being and how it is maintained. This chapter focuses on the particular role of technology within the network and stands in contrast to the investigation of conceptions of technology in Chapter 3. The trajectory of the increased awareness of the entanglement of the social and the technical that were portrayed in Chapter 3 is developed further here. In a similar way the following chapter provides a contrast with Chapter 4 in relation to views of critique.

⁵ The approach of ANT to technology has been the focus of various studies. Rose et al. (2005a) and Rose & Jones (2005) compare ANT and structuration in relation to the issue of agency. See also Walsham (1997), Walsham and Sahay (1999), Vidgen & McMaster (1996), Monteiro (2004) and McMaster & Wastell. (2005). Berg (1998, 1999) has developed an ANT perspective in medical work.

This chapter claims to be able to identify a distinctive nature and role of technology in heterogeneous networks as a necessary element in the articulation of a critique of technology. This attempt seems to be in conflict with the ANT view that all entities are effects of networks and that now essential identities exist. Although there are no human or technological essentials, the question could still be asked what the distinctive role of technology or of humans are within the network. Symmetry does not imply that exactly the same roles should be attributed to different entities. What these roles are, however, could only be established through an empirical investigation of the way different entities are defined in a network.

The most important difference between ANT and other approaches to technology discussed in Chapter 3 is the way it questions the boundaries that are being drawn between the human and the technical. In most of these approaches this boundary remains fixed and predefined since intentionality and choice are unique human abilities and could only be attributed to machines in a metaphorical way. By locating actancy in a hybrid network it becomes possible for ANT to trace the heterogeneous origins of intentions and choices rather than attributing it to a pure form of human autonomy. To claim that humans could, by nature, act in a flexible way, or could always choose to do things differently is to deny the ways in which human agency is the effect of the networks of which they are part. An actant could only choose differently if the opportunity to do so is made possible by the network. Even the different idea could be traced to the discretionary power allocated to a position in a network. This position does not imply a form of determinism because humans, with all their characteristics, participate in the shaping of the network.

It is only once the role of the technical within the network is understood, that the possibility of critique could be investigated. It will be indicated in this chapter that technology plays an extremely powerful role in the constitution and maintenance of the network. The detail of this role could not be understood from the perspectives of either social constructivism or technological determinism (Latour, 1994:239) which inform most of the critical approaches. Inherent to constructivism and determinism is a separation of the social and the technical and an identification of the most basic mechanism through which the network is established, “in the last instance”, in either the technical or the social element. The hybrid nature of the network in ANT makes it impossible to attribute final causation to either of these elements.

The “social” role of the technical is largely ignored by social constructivism, instrumentalism and technological determinism. This role refers to the contribution of technology to participate as an actant in the shaping of the network. Social constructivism attributes social meanings to technology but denies technology an active role in the shaping of these meanings. Technological determinism attributes in principle such a strong agency to technology that the mutual, social processes of negotiation are replaced with the imposition of the structures inherent to technology. For ANT the social role of technology is defined within the network as that of an actant which participates actively in the processes of translation and enrolment. Technology does not impose a structure on the social such as an autocratic form of management (Winner, 1986) or democratic work practices.

This chapter looks firstly at the “nature” of technology without reverting to essentialism. On the basis of this it investigates the kind of roles technology plays in the network. Particular attention is then given to the power of technology and lastly to its contribution to change and order in the network.

2. Nature of technology

In the light of the acceptance of the hybrid nature of all entities, the question could be asked whether it is still possible to talk about humans and technology as distinct entities which make particular contributions to the network. Is it possible to still talk about technology in isolation from the network and to identify the technological actant (McMaster & Wastell, 2005; Hanseth, 2005)?

Latour defines technology in a way that aims to avoid the pitfalls of materialism, instrumentalism, substantialism and social constructivism. None of the entities in the network could be seen in a substantive way since autonomy and independence are relative attributes within the network. It is not possible for technology to exist as an independent entity with an own inherent logic and structure. Technology could also not be seen in an instrumental way because that would elevate humans to the position as the only possible actant who uses technology for their predefined purposes. Instrumentalism denies the effect of a technological actant on humanity and on human purposes. For the same reason technology cannot be seen as a social construction. Here the social is narrowly defined as consisting of pure human

relations in whom technology plays a marginal role. The challenge is to define the role of technology in a non-essentialistic way.

2.1. *Non-essentialism*

On the basis of its relational ontology, ANT questions the idea that there is an “order of things” with established definitions and boundaries such as those between the human and the technical. Technology does not have an essential nature and does not have the same substantial effects in different contexts. This is implicit in the view of Law (1992:387) who argues that a network becomes more durable when relations are embodied in material forms, such as technology. This does not mean, however, that the same material form will always have a particular effect. The durability of material objects is not an inherent feature, but a relational effect of the network. It depends on the particular alignments of the network whether certain prescriptions inscribed in technology would have such a lasting effect. The same technology does not have the same effect wherever it is employed, but the kind of effect is dependent on the network as a whole.

The ANT conception of technology differs from the substantivist and essentialist views of Heidegger and Kallinikos (Chapter 3, Section 3). All identities and processes are outcomes of the network itself. Since the particular nature and role of technology is an effect of the network within which it operates, it does not have an “inherent” or “transcendental” nature. It may happen that technology assumes in a particular network a substantial, dominating and “self-referential” identity, as seen by Kallinikos (2004). It may also happen that the identity of humans is defined in such a way that only certain kinds of behaviours are allowed and that other elements of their personality such as values or feelings are excluded. These particular views of the technological and the human should, however, not be seen as their inherent features, but as the way a particular network was assembled and entities enrolled. The question needs therefore still to be asked how these particular technological effects came into being; how it is black boxed so that its human users are denied certain characteristics and enabled to display others. Although Kallinikos’ descriptions of modern computerised organisations may be empirically true, the critical question needs to be asked how they come into being and how they maintain themselves. The nature of the modern organisation could not be read off the nature

and functioning of the technology that is being employed in them. From the ANT perspective, Kallinikos is wrong in so far as he does not only provide a descriptive account of technology and organisations, but a normative one.

ANT also disagrees with Winner's dual view of technology. Winner (1986) accepts on the one hand that some technologies are flexible because they could play different possible roles in a particular context. Winner argues, on the other hand, that some technologies are "intractable" because they determine a particular social organisation. This is, for example, the case with nuclear technology which imposes an autocratic social organisation because of the need to ensure strict safety mechanisms. An ANT response would be that no such essences exist by themselves and that the way a network becomes total should be traced empirically.

Because of the non-essentialistic nature of technology a careful tracing of the networks within which it operates is required in order to establish what kind of role it plays.

2.2. *From Technology to technique*

If the functioning of technology could not be traced to an essential nature, how should it be understood? In order to accomplish this shift from substantialist and essentialist views, ANT rather talks of "technique" and "technologising" than of Technology with a capital "T". As such technology refers to particular processes as part of a programme of action within a network.

Techniques are what happen to tools and nonhuman actants when they are processed through an organization that extracts, recombines and socializes them (Latour, 1999b:210). This conceptual shift from a substantial entity to a process acknowledges that technology does not exist in a pure form or operates according to an inherent logic, but that it fulfils particular roles in a programme of action. Although the term "technology" will be used in this study, it should not be seen as a substantial entity, but as techniques which could fulfil various roles within the network. Although we associate technology strongly with physical objects such as a computer, or a speed bump, such an object must always be seen as the end product of long technical processes (Latour, 1999b:191) or techniques. One should therefore rather talk about the process of technologising than about technology as such. By focusing

on Technology, one already assumes a black box which hides the (technical) processes that made it possible.

The technological object is therefore not an entity functioning on its own, independently of contexts, but it finds its function and identity as part of a (heterogeneous) network.

Accordingly, technical objects must be seen as a result of the shaping of many associated and heterogeneous elements. They will be as durable as these associations, neither more nor less. Therefore, we cannot describe technical objects without describing the actor-worlds that shape them in all their diversity and scope. (Callon 1986a:23)

The heterogeneity of these actor-worlds entails that both humans and nonhumans play an active role in its constitution since some portions are delegated to humans or nonhumans (Latour, 1994: 254). To see the technological entity in isolation is to forget about the history of the entity and of the particularities of the network of which it is a part.

A new software package, a new computer site, a new chip, a new anti-trust policy, a new electronic forum will not be seen as having to do with technology, or labor organization, or culture, or law but as the heterogeneous branching out of a rhizome. (Latour, 1996c:303)

The concept *technologising* indicates an active role to technology which is not just that of an instrument. This active role will be pursued in more detail in what follows. Technologies are presented as actants and not merely as tools or instruments.

[T]hey should be seen as forming an integral part of such systems, interwoven with the social, the economic and the rest, and their form is thus a function of the way in which they absorb within themselves aspects [of] their seemingly non-technological environments. (Law, 1986:236)

In response to the quest for specificity about the technological artefact, it should be clear from this subsection that one could not expect ANT to provide clearer definitions of technology. The kind of specificity ANT looks for has to do with the careful tracing of the process of technologising in networks as will be described in the following subsections. Technology is always associated with artefacts but distinguishes itself from other objects in the way it is designed as part of certain plans of action.

2.3. *A thing that gathers*

If technology is more a set of processes which perform actions, we should be able to describe the nature of these processes in more detail in order to answer the question about the kinds of action it performs. The role of technology in the network becomes clearer against the background of Latour's theory of the "thing". Whereas a "thing" seems to indicate an inanimate material object such as a bridge or a cup, a much richer understanding is possible if the Heideggerian (1977) background of the concept is taken into account. For Heidegger a thing should be seen as a "gathering" which brings various elements together. Latour expands this concept by showing that it is not only humans that are gathered, but also nonhumans. Any "thing" is not simply an object existing on its own, or a fiction of the imagination, but it actually gathers many entities.

It was clear from Chapter 4 that the network is a hybrid entity and not simply a society consisting of humans. The notion of the "thing" explains the nature and functioning of hybrid entities which are neither purely human (subjective, social) nor purely natural (objective). With the notion of the "thing" Latour shows how he moves beyond the objectivism of realism and of empiricism and beyond the subjectivism of constructivism.

A thing is, in one sense, an object out there and, in another sense, an issue very much *in* there, at any rate, a *gathering*. To use the term I introduced earlier now more precisely, the same word *thing* designates matters of fact and matters of concern. What would happen, I wonder, if we tried to talk about the object of science and technology, the *Greensand*, as if it had the rich and complicated qualities of the celebrated *Thing*? (Latour, 2004c:233)

This understanding of the thing could be applied to technology:

Techniques imply not society but a semi social organization that brings together nonhumans from very different seasons, places, and material. (Latour, 1999b:209)

The comparison of technology with a thing that gathers refutes the understandings that objects are inanimate things which function according to natural laws or that objects are nothing more than the product of social meanings and programmes. Latour (2004c) explains that an object such as the space shuttle Columbia only seems to be a matter of fact that is closed, efficient and autonomous. Its *thing*-like nature appears clearly when one focuses on the way it gathers multiple entities.

These entities that are brought together in the thing become particularly apparent when the object failed or crashed and an investigation reveals the numerous heterogeneous entities that had to be brought together into the object. This investigation in the case of the Columbia reveals what is gathered: statements by politicians, concerns of the public and views of scientists and technicians. This revealing helps to understand what happened when the network disassembled and to trace what is required to put all the pieces together again. It shows not only which entities were enrolled to make up the network, but also what is involved to maintain its coherence and durability.

The gathering takes place through a process of “folding” (Latour, 2004c:231). As paper is folded to bring two separate points together, so technology brings together different periods, ontologies, genres (Latour, 1993:73; Latour, 1999b:209) or kinds of actants. What is distant, are brought together in close proximity. Boyle’s vacuum pump, for example, “associates, combines and redeploys countless actors” new and old (Latour, 1993:72). in a particular context. The gathering could also be described as a juxtaposition of different elements. The Portuguese vessel was juxtaposed “with the right kinds of people and instruments” (Law, 1986:251). Time and space is folded in the case of an axe which brings the current user in touch with the users in the distant past when the axe was first designed. The workshop where the axe is used now is brought together with the tree in the forest where the wood comes from. The hinge folds time once installed because it performs its function without interference and only needs occasional maintenance. In the case of a door groom the time of the installation is brought in contact with every time it closes the door. The folding of time is also called perpetual movement where an entity moves without any interference from outside. The folding of time takes place when the initial maker of the object is absent, but the object still acts in the present. Different kinds of actants are brought together when the actions of the policeman is delegated to a speed bump which acts as a place-holder.

This bringing together of diverse entities is central to the assembling of a network. It is a process of socialisation within which entities are combined and recombined (Latour, 1999b:210). In this process characteristics, competences and functions are transferred from one entity to the other through mediation, inscription and delegation. In the case of the speed bump the entity, *concrete*, is brought together with the

entity, *the rule* “do not speed”, and with the entity *policeman*, whose task it is to enforce the rule. In the process a gathering, or a network, has been formed through the sharing and transfer of competences and characteristics. In this network the durable characteristics of concrete is combined with the moral appeal of the policeman. The unique characteristics of the new network ‘emerge’ since it is not simply the combination of the characteristics of the combining entities. The process of gathering brings out new characteristics, identities, tasks and competences.

The gathering role is not “passive” in the sense that different entities are merely brought together to remain separate with their predefined identities. The technological gathering has a profound effect on the entities brought together because of the interchange of characteristics and the emergence of new ones which is not simply the sum of the characteristics of the constituting elements.

They [artefacts] enter the collective, not because they close the mouth of intentional humans, stop the controversies of squabbling scientists, bring passive resources to the inventive mind, offer a convenient receptacle for social values, but, on the contrary, because they *add* intentions, controversies, activities, meanings to programs of action that would be, without them, too limited and narrow. (Latour, 1996c:301)

A network, such as an information system, often hides the entities that were brought together. The fact that they were brought together in an apparent harmonious whole hides the fact that different periods, kinds of actants, genres and ontologies had to be folded to achieve the network.

Whereas technology contributes to this folding, a critique of technology should “unfold” it. What seems to belong together in an efficient network should be taken apart in order to see what processes of translation made it possible. A simple test to establish what is gathered in a network is to ask: what and who is being replaced by technology and what effect does it have on the network. When one investigates what the contribution of the hinge is to the network, the question is: what kind of work is needed to break down and rebuild the wall each time you want to be on the other side (Latour, 1994:228)? The same kind of test could be used to establish what kinds of entities are brought together through ICTs (Latour, 2004a:70), or through an information infrastructure, or through standards.

Since the formation of a network is centrally through processes of association and translation, one could appreciate how central the gathering role of technology is. The involvement of technology in the central processes where the network is formed therefore underlines the need to scrutinise very carefully what this role entails and what the effects are of different kinds of gathering.

2.4. Mediation

The notion of gathering implies that a technological object represents and in some cases hides the techniques that were not only present in the design of technology, but also in its functioning. The central and powerful role technology plays within the network could also be seen in the way it mediates and translates. Technology mediates when it comes in between other entities in the process of relating them to each other. The “essence of a technique is the mediation of the relations between people on the one hand and things and animals on the other” (Latour, 1995:272). Mediation is the process through which properties are interchanged between humans and things.

Technological mediation is a form of detour (Latour, 1996a:219). The technological gathering is part of a programme of action through which certain purposes are achieved. It is realised that the purpose cannot be achieved without the employment of technology such as when the Portuguese realised that they could not reach the Indies without the technology of the vessel. Although technology appears to be an instrument through which predetermined purposes are achieved, employing technology constitutes, however, a detour. In order to achieve the purpose, you first need to go another route.

It seems to me that it is more adequate to speak about technologies in the mode of the *detour* than in that of instrumentality. Technology is the art of the curve, or what, following Serres, I have called ‘translation’. (Latour, 2002a:251)

As a detour, or a mediation, technology changes what it conveys. The detour represents a shifting out and down, a displacement. With reference to a classification system, Bowker, Timmermans & Star (1996:363) discuss how classification systems “create a displacement of interests”. Technology is not only a means towards a

predefined end, but affects the end as well so that the initial intention and purpose have been transformed.

In order to better understand this mediating role, the concept *mediator* must be distinguished from the concept of an *intermediary*. Whereas the latter transports a message with the original meaning intact (Latour, 1993:77/8), a mediator, on the other hand, changes what it conveys. Mediators are “actors endowed with the capacity to translate what they transport, to redefine it, to redeploy it, and also to betray it” (Latour, 1993:81). Although Callon does not distinguish the two concepts, what he says about the intermediary applies to Latour’s mediator. Callon (1991:135) states that

intermediaries *describe* their networks in the literary sense of the term. And they *compose* them by giving them form. Intermediaries thus both order and form the medium of the networks they describe.

Because of its mediating role, technology is not simply an object, but an actant. As a “quasi-object” it is imbued with “action, will, meaning, and even speech” (Latour, 1993:136). The notion of a “quasi-object” means that technology is not purely an object or a subject. It may seem to be an object but it also participates in a programme of action as an actant. It has to be remembered that technology is not a subject on its own, but could only act as part of a network.

Latour distinguished four meanings of technical mediation (Latour, 1999b:178ff.): interference, goal translation, composition and black boxing. In each of these we notice how techniques mediate meaning and change purposes. *Interference* refers to the detour that must be taken through techniques in order to achieve the purposes of a programme of action⁶. When it is discovered that a particular goal could not be achieved without the association with an object, a necessary detour is needed to obtain and incorporate the object. In this process the goal itself shifts according to the second meaning of technical mediation. A *goal translation* entails the shift from one goal to the other. As is the case with the translation of a word in English into a word in French, it consists of “the creation of a link that did not exist before and that to some extent modifies the original two” (Latour, 1999b:179). This is illustrated by

⁶ Interference is similar to Callon’s (1986b) notion of *interesse*, discussed in Chapter 4.

Latour by means of the example of a person with a gun. Such a person, or the new network, the person/gun, has different goals than the person without a gun. The person does not simply take over the “purpose” of the gun by acting out the script embedded in technology. The goal of the person/gun is different from the goals of either one on their own. A new actor now appears, the person/gun, which is different from both the person and the gun prior to the association. “They become someone, something else” (Latour, 1999b:180). The result is that the “[r]esponsibility for action must be shared among the various actants” (Latour, 1999b:180), and “...action is a property of the whole association, not only of those actants called human” (Latour, 1999b:183). The initial goals shift in unpredictable ways and cannot be related to the goals of any of the entities that are brought together. Techniques do not merely mirror social relations, but “remake these very relations through fresh and unexpected sources of action” (*ibid.*). Techniques are not scripts that are merely acted out by people, nor is technology an instrument in the hands of purposeful humans.

The third meaning of technical mediation, *composition*, refers to the addition of more actants in the programme of action. “Action is simply not the property of humans *but of an association of actants*” (Latour, 1999b:182). Actants exchange competence and offer new possibilities and new goals. The result is that none of the entities that enter the association remains the same. The last element, *black boxing*, will be discussed in more detail below. It refers to the enrolment of various actants and programmes of action into a single punctuated whole (Latour, 1999b:185). What is assembled only become visible if the black box breaks down.

It has been indicated that the instrumentalist view of technology is pervasive in much of the critical literature. It should be clear by now that, as a mediator, technology could not be seen in an instrumentalist way such as when Ngwenyama & Lee (1997) show how email is used as a tool for the achievement of communicative purposes in order to overcome the problem of distorted communication. The same is the case with Cecez-Kecmanovic *et al.* (2002) who show how IS is used in democratic decision processes in the realisation of emancipatory (communicative) rationality. Since technology is not simply “used” (Monteiro, 2004:135), as a mediator it changes what it mediates and shifts ends in unpredictable ways.

The process of mediation represents a translation of identity and interests and contributes towards the enrolment of entities in a network. Technical mediation translates the interests of one entity in terms of the interests of another.

2.5. Delegation and inscription

Inherent in mediation are the processes of delegation and inscription. *Delegation* refers to the transfer of functions from humans to things. “I will define this transformation of a major effort into a minor one by the words *displacement* or *translation* or *delegation* or *shifting*” (Latour, 1994:229; also Latour, 1988b:299). The work of breaking down the wall each time you need to pass through it was delegated to the door and the hinge. The responsibility of the policeman to enforce the law is delegated to the speed bump (Latour, 1999b:186). The task of the human groom is delegated to the automatic door closer. Similarly, force, values, duties and ethics could all be delegated to nonhumans through the interchange of characteristics (Latour, 1999b:186). The “matter” of expression is changed from a person or a sign to a material object such as concrete or steel. The actorial shifting is a “shifting down” when action or meaning is transferred to a different kind of actant. Nonhumans now “also act, displace goals, and contribute to their definition” (Latour, 1999b:186). The object stands in for the actor (Latour, 1999b:189).

Because of the mediating role of technology, the function, message, value or meaning that is delegated inevitably changes. It is not only the mode in which the expression takes place which changes, but also the meaning itself. Form and content cannot be separated. In the process of delegation *meaning is modified*. The implication for IT is that it is not only the form of the communication, but also the meaning of what is being communicated which changes when IT is brought into a network (Latour, 1999b:186). Information technology is not only the conduit of information, but changes that which it conveys. Whereas substantive views of technology predict that the same changes will always happen, ANT follows the actors to establish what effects are being produced in every situation.

Inscription is a particular kind of delegation. It is the process where functions, meanings, values or interests are written into, or translated into material form (Callon 1991:143) such as technology. Human action is inscribed in technology when the

actions of people who fail to close the door in spite of the written notice and moral appeals, or the porter who is unreliable, are inscribed into the automatic door groom. Competence is now shifted to nonhumans (Latour, 1999b:211).

Akrich (1992:208) defines inscription as follows:

Designers thus define actors with specific tastes, competencies, motives, aspirations, political prejudices, and the rest, and they assume that morality, technology, science, and economy will evolve in particular ways. A large part of the work of innovation is that of 'inscribing' this vision of (or prediction about) the world in the technical content of the new object.... The technical realisation of the innovator's belief about the relationship between an object and its surrounding actors is thus an attempt to predetermine the settings that users are asked to imagine...

The notions of delegation and inscription have been explained and empirically researched within the context of constructivist approaches. Cordella & Shaik (2003:5) report on various IT projects where interests and beliefs are inscribed in technology. Bowker, Timmermans & Star (1996) show how nurses' work is inscribed into the NIC (Nursing Interventions Classification) in the process of developing an infrastructure. Monteiro & Hanseth (1996:10) describe the translation and inscription of pharmacists' interests in the drug list which they do not simply want to share with general practitioners because it contains information about profit margins. They discuss four aspects of inscriptions: (i) what is inscribed, that is, which anticipations of use are envisioned, (ii) who inscribes them, (iii) how are they inscribed, that is, what is the material for the inscriptions and (iv) how powerful are the inscriptions, that is, how much effort does it take to oppose an inscription (*ibid.*; also Monteiro, 2000:79).

These inscriptions could be strong or weak.

Analytically viewed, the strength of an inscription relies on three aspects: the size and complexity of the surrounding actor-network which is linked to the inscription, the degree to which it is aligned with this surrounding actor-network and the strength of the inscription on its own. (Hanseth & Monteiro, 1997:208)

Whereas inscription refers to the meanings designed into technology, prescription refers to the behaviour imposed on the users of technology.

2.6. Prescription

The processes of delegation and inscription are not a one-way process from humans to things, because behaviour is also prescribed to humans as suggested in the quotations above. “I will call the behaviour imposed back onto the human by nonhuman delegates *prescription*” (Latour, 1994:232; see also Latour, 1988b:301). A prescription is

[W]hat a device allows or forbids from the actors - humans and non-human - that it anticipates; it is the morality of a setting both negative (what it prescribes) and positive (what it permits).
(Akrich & Latour, 1992:261)

In the case of the automatic door closer the action that is prescribed to humans is to push against the hydraulic mechanism which gathers their power and utilises it to close the door gently. The prescription disciplines humans in the correct use of technology. Exactly what is being prescribed could often be seen in the manuals of a technological artefact, or in the technological standards that govern the behaviour of everything and everybody. This refers to a broader set of conditions that must be aligned to bring the user in tune with the technology.

It cannot be assumed that humans will always behave as expected since not all technology is equally successful in shaping human behaviour. The reason is that not all inscriptions are strong enough to prescribe specific actions to humans.

Technology is more successful to the extent that it *pre-inscribes* human action, by anticipating or predicting human action successfully. Inscriptions are only effective if action is prescribed to users and if users are adequately enrolled in the network. Users have sometimes to be reskilled in order to use the technology as intended (Latour, 1994:232). Bowker, Timmermans & Star (1996:352) discuss how an expert system is only successful “if it is accompanied by a disciplining of local work practice”. Mulcahy (1998) discusses critically in what sense the user is being designed.

Prescription also entails moral and ethical dimensions because it forces humans to behave in the “right” way. A car which refuses to drive if the driver’s seat belt is not fastened, forces the driver to act according to a moral code. The inscription in the heavy hotel key prescribes to humans the instruction to “hand me in at the reception

desk, or carry an extra weight along". Strong inscriptions which lead to strong prescriptions constitute the "politics of an artefact" (Hanseth & Monteiro, 1997:208).

In ANT both inscription and prescription are processes of mediation in which technology is not simply a passive conveyer of messages, but takes part in the process of translation. The consequence is that what is inscribed into technology is not exactly the same as what is being prescribed to humans through the technology. Boland & Schultze (1996), for example, discuss how certain work practices are inscribed in activity based costing and how this technology prescribes actions to humans through the transformation of work and the organization. What they do not indicate clearly enough is how the mediatory role of technology leads to prescriptions that could not be read off the inscriptions. It could be shown in their discussion that technology does not determine human action, but creates a different kind of "discretionary space" within which different kinds of decisions could be taken. They acknowledge this to some extent by indicating that technology leads to a different view of the world. It is therefore important to note the difference between what is inscribed and what is prescribed due to the processes of mediation and translation in order to establish what the effects of technology in the network are. The difference between inscriptions and prescriptions indicate the terrain of technological actancy.

The difference between technological constructivism and determinism can now be described in terms of inscription and prescription. Technological constructivism relies on inscription because technology contains the social meanings inscribed into it. In this case what is prescribed to humans is not a function of technology, but of the human meaning-making processes which determines the function of technology in a particular context. In contrast to this technological determinism relies on prescription when they postulate that technology determines its own effects. The dichotomy between these two views of technology is addressed by the way ANT conceptualises the relation between inscription and prescription. The question remains how exactly the relation between these two processes should be understood. The basic response of ANT is that no generalised judgements could be made about this relation since it should be established empirically and depends on the dynamic relations in a particular network.

2.7. Technology “speaks”

When technology is successful by prescribing and predicting human behaviour effectively through the “alignment of setup”, the need for language is reduced. The mediation is often a replacement of words with silence (Latour, 1994:240). Verbal instructions and signs are replaced with things which prescribe the behaviour of others in a silent way. Latour (1994:249) illustrates the silent role of technology when the continual verbal admonishment to his son: “Don’t sit in the middle of the rear seat; if I brake too hard, you’re dead”, is replaced by the silent force of a steel bar which connects the head rests of the front seats and keeps the child in the back seat. Technological artefacts are characterised by the silent way in which they function. They do not articulate in language what the significance or effects of their functions are. This inability of technology to participate in the network through the required communicative processes is taken as the reason why technology cannot have an active role in the shaping of the network and can’t be listened to. Within the Habermasian framework this is a role that only speaking and thinking humans could fulfil.

The absence of articulation cannot be taken as an indication that technological entities do not contribute to the processes of translation where meanings and identities are shifted. Technology makes in its own way propositions (seen Chapter 6, Subsection 7.2) which contain “statements” about possible entities and distributions within the network. Bowker *et al.* (1996) report on their investigations into the “quiet politics’ of voice and values in information infrastructure”. It would therefore be a gross oversight not to recognise the active role of machines in the constitution of the network because of this silence. Meanings and objects are not only represented in language by humans, but also in non-discursive, non-linguistic ways by artefacts. The speed bump re-present (makes present) the policeman and is saying something like: “I will damage your car if you do not drive carefully”. The implication is, in opposition to the view of constructivists such as Collins & Yearly (1992a), that not only humans represent reality through words, but that the representation could only be in non-verbal forms.

In constructivist views of technology, it is believed that the meanings embedded in technology could be clearly and fully articulated in language. Since social meanings

are constructed by humans into technology, they could be fully extracted and articulated by humans. In ANT, however, the human interpretation of the meaning of technology remains limited and cannot replace the “voice” of technology itself (Cordella & Shaikh, 2003:8). The active role which ANT attributes to technology implies that interests and meanings are mediated and changed by technology. These meanings are not conveyed through language any more, but in a material form. The speed bump is not just a material object, but a ‘meaningful articulation’ of certain warnings and instructions.

In opposition to the constructivist views, it is not possible to fully articulate in language the proposition made by technology. An understanding of the proposition made by a technological artefact is a very complicated process which could only be done from the perspective of the network as a whole. Although a manual is a way to articulate in language “the prescription encoded in the mechanisms” (Latour, 1994:232), it remains only a partial articulation of the multiple ways in which a technological artefact mediates and translates.

An opportunity to hear what “machines silently did and said” is provided when they break down (Latour, 1994:233). Latour shows how the investigation into the failed space shuttle Columbia leads to the production of thousands of pages of text which attempt to trace the design of the *thing* in order to establish which associations did not hold or which translations were not valid. These pages testify to the difficulty to hear what the machine has to say. From a constructivist perspective, one would expect that the functioning or malfunctioning of such a carefully designed object would be transparent to its human designers. The difficulty to clearly establish the voice of technology testifies to the many ways in which the original meanings and plans were mediated by technology. The investigation could therefore not be limited to the intentions and plans of the engineers, but has to trace how these were mediated by technology. Such a tracing of the network shows how the transition from plans and textual designs to things is a mediated process where meanings and goals shift silently. Such an investigation shows that a full description and articulation of all the multiple mediations cannot be done without listening to the silent voice of technology.

Successful technology does not only make a proposition of a possible state of the network, but also realises such a proposition. It has been shown in Chapter 4 that language in ANT is not merely a representation or a mirror of reality, but that it performs reality. Reality does not exist in discourse as the postmodernists see it, since that shows a bias towards human meaning and interaction. In ANT, technology performs, through its propositions, a reality that could not be captured through discourse and which escapes attempts to fully articulate it. Reality is performed by technology in another way than language and discourse. It is an emerging property of the interplay of actants (Cordella & Shaikh, 2003:8).

It can now be seen that the difficulty to fully understand the role of technology in the network relates to the non-linguistic way in which it contributes to the composition of the network and the subsequent inadequacy of any attempt to articulate this role fully in language. Technology “speaks” silently and powerfully.

2.8. *Interpretive flexibility*

The notion of “interpretive flexibility” within ANT refers to the way the same technology could have very different functions in different social contexts. This view must be distinguished from the social constructivist version where it means that the same technology could be understood and used differently in accordance with the social interests that are dominant in a particular context. This is based on the belief that technology is not deterministic and that it could always be employed and understood in very different ways. This notion of interpretive flexibility makes a critical and transformative approach to technology possible since it could always critically be deconstructed and reinterpreted to serve a different purpose. Such a constructivist view of technology is presented by Woolgar (1991a) who comments on Winner’s account of the overpasses over the parkways in Long Island. Winner (1986) provides a critical account of the technology of the roads and overpasses which were designed in such a way that it was too low for buses, the only means of transport for some social groups, such as blacks and working class whites. It is, for Winner, a clear example of how technology could exclude and dominate. Woolgar (1991a) shows how the same technology, the roads, provided access to these previously excluded groups once they were no longer dependent on means of mass transportation and could drive underneath the overpasses with private cars. The

same technology was then interpreted and used differently at a later stage on the basis of changing interests.

The notion of interpretive flexibility obtains a different meaning in ANT. As a participant in a network a technological object reflects the attributes allocated by the network. When the “same technology” becomes enrolled within another network, it acquires different characteristics and cannot be said to be the same any more. The flexibility is not the result of human meaning making as in the constructivist views, but to the dynamic way in which meanings shift in the other network. In the case of the overpasses over the parkways in Long Island, Law (1991b:176) shows how the changed demography made cars more accessible to social groups such as the poor and blacks with the result that the same technology (the roads and overpasses) is now used by these groups to gain access to the beach whereas the overpasses previously denied them access. The “interpretive flexibility” here does not entail a different interpretation of the same technology, but a different reality that came about and to which the same technology had contributed. A different reality is constructed, not socially, but through the different way in which entities are assembled. A similar notion of interpretive flexibility is present in Monteiro’s (2004:135) explanation of how “the same” technology is “used” differently. He explains this by saying that they are “in quite different stages of being interwoven into the social fabric of life” (ibid.).

The notion of interpretive flexibility indicates that there is nothing essentialistic or deterministic about technology as such. The important point is that the function of technology is an effect of the network of which it is part and that it does not determine its own use. In contrast to the notion of interpretive flexibility, essentialistic views of technology attribute to it particular characteristics such as domination (Winner, 1986). Such a lack of flexibility is also present in the view of Kallinikos (2004:155) who claims that the “possibilities for reshaping of enterprise resource programmes (ERP) technology in local contexts are considerably limited”. He (2004:146 ff.) describes the transhistorical and cross-contextual characteristics of technology which prevents it from being interpreted and used in just any way within a particular context. It is not technology that is flexible, but people who must be trained in the correct use of technologies. From the perspective of ANT, the attributes of these technologies are specific to the network and a network effect and cannot be attributed to technology as such.

The notion of the interpretive flexibility of technology contributes to ANT's emphasis on the careful tracing of the actants in a network. It cannot be assumed that the same technology would always have the same role and effects in a network. It also implies that technology has actual effects that make a difference and that these effects should be traced carefully in each network. These effects cannot be read of the intentions of the human designers and users as constructivists see it.

2.9. Hybridity of technology

Once it is realised in ISR that the social and technical could not be separated, it became a problem to relate the materiality of the technological artefact to its role in a social context. In her extension of structuration theory, Orlikowski (2000) points to the duality of technology through her distinction between the technological artefact and technology-in-practice. But according to Hanseth *et al.* (2004:118) she does not resolve the relation between the technological artefact and the (sociological) technology-in-use. For Walsham (1997) there is a close relation between the two when he states that social meanings are embedded in technology and that these embedded meanings are reproduced when technology is used in a particular context.

In ANT, technology is not a purely technical entity, but a hybrid. The hybridity of technology lies in its material and anthropomorphic characteristics. It is anthropomorphic in the way it mediates human meanings, assumes human roles or prescribes actions to humans. A technological object is not simply a natural entity because it participates as an actant in a plan of action such as the groom that closes the door or the door that takes over the work of the people who has to break down and rebuild the wall. Technology is social in the way it contributes to the composition and maintenance of the network. The speed bump is not made of matter alone, but also of values, prescriptions, power and politics. The technological artefact must therefore be seen as a heterogeneous actor-network within which both humans and nonhumans are enrolled. Once the black box is being opened, the multiple relations that make it up become visible.

Latour identifies as one of the important reasons why the project *Aramis* failed the misconception about the hybrid nature of technology:

Yes, they really succeeded in separating technology from the social arena! They really believe in the total difference between the two. To cap it off, they themselves, the engineers and the technologists, believe what philosophers of technology say about technology! (Latour, 1996a:287)

Latour wants to overcome the fact/fetish distinction which refers to the question whether beliefs and knowledge are real or constructed. Applied to technology the question is whether technology is real (substantive entity, fact) or constructed (an instrument, fiction). This distinction attempts to place technology at only one of the two poles of the dualism represented by realism and constructivism. As is the case with scientific facts technology is, in ANT, both real and constructed (Latour, 1999b:274). Latour coins this word “factish” to indicate that technology is not a “matter of fact” or a fetish, but something beyond this separation. We can therefore not say that technology is social meanings frozen into material form (Bowker & Star, 1994:187) because “[t]he speed bump is ultimately *not* made of matter” (Latour, 1999b:190). Having said this, materiality is an important element in technology since it makes a big difference to the irreversibility of inscriptions that they are delegated to a material form. It is, however, more than the material.

2.10. ICT

Information and communication technologies should not be seen in any other way as other technologies. Where Heidegger regards modern technology as inherently exploitative, in contrast to antique crafts, Latour does not make a qualitative distinction between the two. The definitive feature of any kind of technology is that it is involved in the processes of mediation and translation. ICTs therefore also gather and fold as any other technology. The difference between antique and modern technology is not of a qualitative, but of a quantitative nature because modern technologies mediate between many more entities and enable many more associations. The difference between the antique crafts and modern technologies lies in the number of actors that could be gathered in ICTs and the size of the network of which it is part. If modern and antique technologies are involved in the same processes, there is no going back to a stage when technology did not affect human life in profound and ambiguous ways.

Because modern ICTs still mediate and translate in accordance with their role in the network, they do not transform an organisation into a rationalised entity dominated by computer logic (Latour, 1996c). The way a software package makes associations, delegates, changes essences, translates or shifts, is no different from any other technique within any other network. Since the rhizomatic spread of the network of the modern organisation is as unpredictable as any other, no other methodological approach is needed to investigate the role of information technologies in a network.

It is no longer clear if a computer system is a limited form [of] organization or if an organization is an expanded form of computer system. Not because, as in the engineering dreams and the sociologists nightmares, complete rationalization would have taken place, but because, on the opposite, the two monstrous hybrids are now coextensive. (Latour, 1996c:302)

For this reason the development of a network in which standards and information infrastructure play an important role, could be investigated in the same way as any other network (see Monteiro & Hanseth, 1996). Although the setting of standards is a complex process where interests and identities are translated, and entities enrolled, it could be disentangled as any other network.

Information technologies" obviously form a specific group of technologies. Much more than other types of technology, computers are "representational media" and "language machines" (Agre, personal communication). Although such distinctions might be crucial to other arguments, I maintain that a distinction between technologies in general and information technology in particular is not of fundamental importance to the argument set out here. (Berg, 1998:483)

Although various definitions could be given of information technologies, it does not serve the purposes of this study, as testified to in the following view:

Information technologies obviously form a specific group of technologies. Much more than other types of technology, computers are "representational media" and "language machines" (Agre, personal communication). Although such distinctions might be crucial to other arguments, I maintain that a distinction between technologies in general and information technology in particular is not of fundamental importance to the argument set out here. (Berg, 1998: 483)

3. Technology and the network

It should be clear from the above discussion that technology is not an entity operating on its own. Although one can always distinguish techniques as such, they

do not operate in isolation from the rest of the network. The technical contributes in important ways to the establishment and maintenance of the network. In the previous section general characteristics of technology have been discussed. This section investigates the kinds of roles technology plays in the network and the following two sections deal with the power of technology and the role of technology in the processes of change and ordering. The kinds of roles played by technology and the complexity of interactions between humans and nonhumans are well explained by Rose *et al.* (2005a, 2005b) even though they misinterpret the symmetry-thesis.

3.1. Multiplication of hybrid entities

For ANT the network is a hybrid consisting in a seamless way of “humans” and “nonhumans”. The phrase that “I am folded into nonhumans” (Latour, 1999b:189) implies that the very meaning of humanity is already constituted through technological mediation. It is not correct to think in clearly distinct categories about the human and nonhuman since reality is made up of networks which cannot be neatly placed in each of the categories. Whereas humanism defines the human as clearly distinct from things, Latour shows that definitions of the human are an outcome of the network. This view of humanity would only be experienced as alienating if humans were to be defined in terms of a pure essence uncontaminated by things. For ANT in contrast, it is threatening to humans if they were to be identified in terms of an essential identity separated from their embeddedness in hybrid networks. Human nature must rather be seen as the set of its delegates and its representatives, its figures and its messengers (Latour, 1993:138).

For Latour, the problem with modernism lies in the way it attempts to purify entities by separating humans from nonhumans, the social from the technical and the subjective from the objective. This purification happens when humanists define the human in contrast to things by attributing to humans alone the unique characteristics of autonomy, rationality and morality. For the humanists, society is constituted purely through a social contract (Rousseau, 1762) which consists of an agreement between rational, communicative and autonomous (human) individuals. This contract is seen to be strong enough to make the social order possible and to maintain a level of morality. By keeping nonhumans (such as machines) separate from humans, the

moderns could keep society free from the intrusion by things and guarantee human freedom.

For Latour (1993) this constitution of modernity prevents it from adequately conceptualising hybrid entities such as technology. In the process of purifying the human from the natural, no place exists for anything in between. According to Latour, this purification made it, paradoxically, possible for the moderns to multiply hybrid entities because they were not seen as a threat to human nature as such (*ibid.*, p.42). Modernism was not concerned about the proliferation of hybrid objects because it did not recognise their ability to change the nature of the social. The modern “[c]onstitution allows hybrids to proliferate because it refuses to conceptualize them as such, then it remains effective only so long as it denies their existence” (Latour, 1993:132).

In opposition to this description of our time as modern, Latour uses the term *nonmodern* to overcome the limitations of both modernism and postmodernism. “We have never been modern” because modernity did not quite succeed in separating the human from the technical. The multiple hybrid entities impact on human nature to the extent that the typical human characteristics such as intelligence and intention are redefined by means of technologies (Latour, 1996b:301). Technology has become an integral and pervasive part of society:

Technology is not far from the social realm in the hands of the technologists: it is social relations viewed in their durability, in their cohesion. It is utterly impossible to think for even a minute about social relations without mediating them with hundreds of entities. Of course these nonhuman entities may be dismissed... (Callon & Latour, 1992: 359, 360)

This hybridity is confirmed in empirical ANT research such as that of Bowker, Timmermans & Star (1996:351) who show in the development of infrastructure that “political, cultural, ethical, social, religious, economic and institutional factors each play a role in its development”.

This understanding of the hybridity of technology is in contrast with substantive views of technology which define technology in a pure way, such as Kallinikos’ (2004:149) notion of the systemic, self-referential and functional simplificatory nature of technology. The self-referential and systemic nature of technology does not allow for “interpretive flexibility” and determines its own application, it imposes a “procedural

standardization” (*ibid.*, p.150). What modernity did not actually realise when they multiplied hybrid entities is that these entities are not purely technical since they came to share many human characteristics.

The first thing to note therefore about the role of technology in society is the abundance of technological objects in the network. Technological objects are part of the large body of entities which proliferate “in the middle” between the poles of the purely human and the purely natural (Latour, 1993). The hybrids cannot be seen as marginalised entities, because humanity and human society are not conceivable without the presence of these nonhumans. It could then be said that neither the purely human nor the purely technological exist (any more). This is confirmed by Monteiro (2004:134) who sees technology as part of the life-world of humans. For him better insight is gained into technology if we focus on “mundane” and “everyday” technologies “where we mingle around it without much ado”.

The hybrids multiply between the pure subject and the pure object, to such an extent that the middle (the place between the pure subject and the pure object) becomes the starting point to think about reality:

Everything happens in the middle, everything passes between the two, everything happens by way of mediation, translation and networks, but this space does not exist, it has no place. It is the unthinkable, the unconscious of the moderns. (Latour, 1993:37)

The result is that reality does not fall neatly into subjective and objective elements, but it lies in the middle terrain which consists of the hybrids. The extremes of pure subject and object could be seen as “provisional and partial results” of the network (Latour, 1993:78). The pure categories of *nature* and *society* are the outcomes and not the beginning for the understanding of reality, they are the “satellites” around the middle terrain (Latour, 1993:79). Both “nature” and “society” are now in the position where they require explanation and where they cannot be used as the basis of the explanation of hybrid entities (Latour, 1993:80).

Latour (1993:133) could express appreciation for the work the moderns did:

The moderns’ greatness stems from their proliferation of hybrids, their lengthening of a certain type of network, their acceleration of the production of traces, their multiplication of delegates, their groping production of relative universals....their daring, their research.... The freedom of a

society liberated from objects... On the other hand, we cannot retain the illusion that moderns have about themselves.....: atheists, materialists.....

This approach makes sense if one looks, for example, at an organisation where most of the entities are of a hybrid nature. The manager cannot be seen as a pure human entity because s/he is produced by a variety of structures, procedures and technologies. The concept “production” refers to the fact that the manager does not merely use these elements, but s/he is in important ways constituted by them. The manager is only able to take decisions on the basis of technology such as audit reports which organise and present information in a certain way. A discretionary space which enables decision making is created by documents, reports, computers, telephone and fax. If the whole is seen as a “hybrid collectif” (Callon & Law, 1995), the purely human or purely technical are abstractions that may be created for particular purposes.

Since the processes of mediation are so dominant and pervasive it is not possible to purify humans or nonhumans. In this sense Latour (1993:47) could claim that modernity has never begun because the process of mediation has been present all along to undermine the process of purification:

But the machine for creating differences is triggered by the refusal to conceptualize quasi-objects, because this very refusal leads to the uncontrollable proliferation of a certain type of being: *the object, constructor of the social, expelled from the social world, attributed to a transcendent world that is, however, not divine – a world that produces, in contrast, a floating subject, bearer of law, and morality.* (Latour, 1993:112)

Because of the processes of mediation, a network becomes complex:

Pandora’s box cracks open and calamities emerge one after another. Is program B a means? Or C? or D? Nobody knows. Does program B – or C or D – count at all, or has it become a definitive obstacle? Nobody knows. Each one has become a mediator and now has to be reckoned with, for it transforms the goals and redefines the hierarchy between main and subordinate, goal and means. What was complicated has become complex. (Latour, 1996a:220)

3.2. *Morality of technology*

One could expect that such a large number of hybrid entities would have a profound effect on the network. The quantity of hybrid entities translates into important

qualitative differences. Through translation and mediation things become part of the network in such a way that they make society possible, durable and moral. They do not only contribute to the network as inanimate objects, but they actively maintain the network. In this way technology enters the terrain allocated traditionally to the purely and exclusively human.

The contribution of technology to the morality of the network lies in the way it brought an element of consistency in relation to moral commands. Humans cannot keep society together because their behaviour is for Latour too erratic and unpredictable as could be seen in the way they continuously ignore written and spoken commands or agreements. The presence of a social contract or cultural prescriptions is also not enough to enforce the desired action. Society could only become consistently moral through the action prescribed to humans by technologies. Morality in this context means the visible human behaviour that is acceptable according to societal norms. Hybrid entities have the disciplining power to keep humans in line and to co-define what normal behaviour is.

One finds various examples in the writing of Latour where the important role and superiority of technology in the promotion of the morality of the network is illustrated. One of these is the way morality is built into the design of the car seat belt. The legal requirement to use the seat belt is easily ignored by humans, but once the mechanisms have been adapted to prevent ignition without having the seat belt fastened, little choice is left but to act as prescribed. In this way the human becomes more moral in following the rules of the network (Latour, 1994).

The programme of action 'IF a car is moving, THEN the driver has a seat belt' is enforced. It has become logically – no, it has become sociologically – impossible to drive without wearing the belt. I cannot be bad anymore. (Latour, 1994:226)

In another example the verbal or written prescription to people to close the door did not prove to be strong enough to be attended to. The installation of the automatic groom ensures, however, the morality of the network. The warning sign next to the road to slow down does not have much effect on motorists. It is only when a speed bump is installed that the desired moral behaviour is obtained. The required behaviour of the hotel resident is re-inscribed in the Berliner key (Latour, 1994:253).

This is a clever translation of a possible program relying on morality into a program relying on dire necessity. (Latour, 1994:253)

Latour can therefore conclude: “In spite of the constant weeping of moralists, no human is as relentlessly moral as a machine” (Latour, 1994:232). The extent of this is such that the “sum of morality does not only remain stable but increases enormously with the propagation of nonhumans” because the network cannot be held together with “soft humans and weak moralities” (Latour, 1994:227). Something “socially strong and highly moral” such as machines is needed.

We have been able to delegate to nonhumans not only force as we have known it for centuries but also values, duties, and ethics. It is because of this morality that we, humans, behave so ethically, no matter how weak and wicked we feel we are. (Latour, 1994:232)

The inscription of rules into technology makes the rules more durable, invisible and irreversible. It is clear that means and ends cannot be neatly separated as far as technology is involved. Technology cannot simply be seen as providing the means towards the ends decided on by humans, but it contributes to establishing the moral ends (Latour, 2002a).

3.3. *Humans and technology*

In humanist views a contrast is made between the human and the technological where technology is defined as inhuman as such. To know what the truly and essentially human is one has to subtract all technology. This gives rise to various kinds of critique of technology such that it impedes on the life world, or leads to alienation. According to these views, social relations are created and maintained through purely social means. No role is envisaged for technology in the constitution and maintenance of society except in an instrumental or a substantive role. In the first sense it has to be domesticated and in the second sense it has to be limited.

For Latour humans and technology are closely intertwined. At the basis of this lies the interchange of properties between humans and nonhumans. Some things are being learnt from nonhumans and imported in the social realm or transferred from the social to the nonhuman (Latour, 1999b:212). In the network characteristics (typical human or technical) are redistributed among humans and machines (Callon & Latour, 1992:360). The result is that the boundary between the human and the

technological becomes blurred (Latour, 1996c:300). No aspect of humanity such as reasoning, choice and intention is untouched by technological mediation. Reasoning and intelligence are also effects of the network:

Not only has its cognition been distributed, situated, but it is now shared with many intellectual technologies to the point where studying the human is studying a field of forces and transfers of documents, instruments, ideographies, through a network of similarly distributed fellows, some of them look anthropomorphic but many don't. (Latour, 1996c:300)

And

Intelligence no longer seems a psychological or even a cognitive property, but something more akin to heterogeneous engineering and world making, a distributed ability to link, associate, tie, fragments of reasoning, stories, action routines, subroutines, and to hang them to many holders; some of them look like neurone nets, other like software, other like graphics, still other like conversations and rituals. (Latour, 1996c:301)

This new entity, which Haraway (1991) calls the cyborg, is neither pure machine, nor pure human but something else. This new kind of entity is described by Latour (2002a:250) with reference to the human/hammer entity which comes into being when a human uses a hammer. Through this association with the hammer what it means to be human has changed. The hammer is not simply a tool used for predefined purposes because it makes new purposes and mental schemes possible.

With it in hand, the possibilities are endless, providing whoever holds it with schemes of action that does not precede the moment it is grasped. It is what James Gibson has so well documented with the notion of 'affordance', at once permission and promise: thanks to the hammer, I become literally another man, a man who has become 'other', since from that point in time I pass through alterity, the alteration of that folding. (Latour, 2000a:250)

Human evolution is closely intertwined with the development of technologies. Latour claims that it also precedes language.

However, it is enough to briefly take account of the work by paleontologists and historians of antiquity to recognize that, according to them, the question of the emergence of technologies and that of humanity have been mixed up for about two and a half million years. (Latour, 2002a:248)

Technology is therefore not merely an instrument used for predefined purposes, but it shapes the nature of the human. The shaping of humanity does not take place in accordance with a technologically determined future (Heidegger), which would result

in technologising the human. Technology is also not anti-human as humanists would believe. The integral role of technology in constituting the human does not derail humanity, but contributes to the shaping of it. What is distinctive about the human cannot be realised without technology. The price to pay for the farewell to essences (Latour, 1995:278) is that no true human nature that would remain intact over time or place, exists. The result of the absence of essences is that the boundaries between the human and the technology shift continually. Bloomfield & McLean (1996:374) report on various studies in which the effect of technology on cognition is indicated. Attention must be given to "...the ways in which thinking about the world in terms of information and information processing changes our conceptualization of ourselves and the world around us". "Reconceptualising the world through IT" is not necessarily an intended outcome of the introduction of ITs.

Anthropomorphism is not an inappropriate transfer of meaning and action from the human to inanimate objects, because technology already reflects in many ways the "human form" which could in any case not be defined outside the network (Latour, 1994:236) or separate from other morphisms: "By seeking to isolate its form from those it churns together, one does not defend humanism, one loses it" (Latour, 1993:137). Technologies are anthropomorphic in the following three senses: they are made by humans; they substitute for human actions by taking the place of a human (delegation); and they shape human actions (prescription) (Latour, 1994:235). Technologies are not particularly "humanised" by a design in an explicit human form since inscription is always present whatever external form the technology is shaped into. A computer which resembles the human figure does not necessarily share more human characteristics than the steel cabinet with circuits and wire.

In the light of the perceived extremes of the human and the material, or technological, engineers combine them into a seamless chain in which competences and actions are distributed (Latour, 1994:243). "It is the complete chain that makes up the missing masses, not either of its extremities" (Latour, 1994:244).

The paradox of technology is that it is thought to be at one of the extremes, whereas it is the ability of the engineer to travel easily along the whole gradient and substitute one type of delegation for another that is inherent to the job. (Latour, 1994:244)

The result of this entanglement of the human and the technological is that engineers do not only build a technological system, but simultaneously a society. In his description of *Aramis* Latour (1996a:viii) explains his work as follows:

I have sought to show technicians that they cannot even conceive of a technological object without taking into account the mass of human beings with all their passions and politics and the pitiful calculations, and that by becoming good sociologists and good humanists they can become better engineers and better informed decision makers.

The interchange of properties between humans and machines takes place in many ways such as when humans are replaced by machines, where machines prescribe roles to humans, or where humans delegate functions to machines. In a programme of action certain functions are delegated to machines and some prescribed to humans so that a “distribution of competence” takes place (Latour, 1994:233). It is not a one-sided process where machines increasingly take over human tasks.

Specialists of robotics have abandoned the pipe dream of total automation; they learned the hard way that many skills are better delegated to humans than to nonhumans, whereas others may be taken away from incompetent humans. (Latour 1994:256, note 6)

Even intentions are not pure human functions but they are affected by technology. We do not have first intentions and then develop the tools to realise them. The “tools” are not mere means towards predefined goals because the ends themselves are shaped by technologies (Latour, 1996a:32; 2002a:248).

If we fail to recognize how much the use of a technique, however simple, has displaced, translated, modified, or inflected the initial intention, it is simply because we have *changed the end in changing the means*, and because, through a slipping of the will, we have begun to wish something quite else from what we at first desired. If you want to keep your intentions straight, your plans inflexible, your programmes of action rigid, then do not pass through any form of technological life. The detour will translate, will betray, your most imperious desires. (Latour, 2002b:252)

The paradox of technology is that it is always praised for its functional utility, or always held in contempt because of its irritating neutrality, although it has never ceased to introduce a history of enfoldings, detours, drifts, openings and translations that abolish the idea of function as much as that of neutrality. How dare we qualify as neutral the ontological drama of unexpected assemblages of entities which can pass, without a hitch, from zero to infinity? (Latour, 2002a:255)

This drift is well illustrated by Scott & Wagner (2003) in relation to the introduction of an enterprise resource planning system at an academic institution⁷. They show how the detour through the goals of others leads to the changes in the initial goals. Latour (1994: 239) defends his view of the close entanglement of humans and technology by criticising both sociologism and technologism. Sociologism is the belief that, given the competence, inscription and circumscription of humans, the scripts of nonhumans could be read out. Technologism, on the other hand reads out the behaviour prescribed to human actors from the technological script. Translation (displacement, transcription) makes this impossible (Latour, 1994:239).

4. Powerful techniques

While the previous sections investigated the entanglement of humans and technology, it has to be shown what the effects are. These effects are now traced through an investigation into the powerful role which technologies play. This powerful role emphasises the importance of a critical investigation into technology. What is significant about techniques and why a critique of technology is important, is the way technologies shift meanings and identities and in the way they concentrate and distribute power. As an actant, technology makes a particular contribution to the assembly process, and as a mediator it brings something new which was not inscribed into it.

4.1. *Technology as an actant*

Technology is a potential actant within the network since it could make a difference. Whether it actually is an actant, could only be established through a careful tracing of the multiple mediations and translations in the network. Such actancy is denied by constructivists (see Chapter 3, Section 5) and overplayed by substantive and deterministic accounts of technology (Chapter 3, Section 3). In the network-account actancy is attributed to a particular entity around which a network is folded.

⁷ This is discussed in detail in Chapter 7, Section 7.

It has already been discussed that the actancy, or the mediating role, of technology could be seen in the difference between what is inscribed into technology and what it prescribes to other entities. If it is an actant, it does not prescribe to other entities exactly what was inscribed into it. Because of this difference technology adds a new element to the network. Interests are translated, meanings shift, goals are altered and new identities are created. In this way technology could play a role as actant similar to any other human or nonhuman actant.

The notion of technological actancy is highly controversial and generally misunderstood. ANT does not attribute actancy to technology as such, but only to technology which is located in a network as actant. The notion of the technological actant should be contrasted with humanistic views of human agency of which Ciborra is an example. The views of Ciborra are in many ways close to ANT, particularly his notion of “drift” which explains the unpredictable way in which organisations develop. For Ciborra (2000, 2004), drift could be attributed to the operation of “practical intelligence” in organisations which is in contrast with traditional views of organisations operating through calculative rationality. Whereas practical intelligence consists of judgements that are unique to a situation and therefore unpredictable, calculative rationality operates according to universal laws that are applied in the concrete situation. The drift refers to the impossibility to control organisations and to the unpredictable outcomes of practical intelligence within organisational planning. Ciborra (2004:24) associates the functioning of technology to the “dark” (unpredictable) side of organisations. This is an indication that organisations are not fully under human control and that the action of technology leads towards unexpected outcomes. In order to understand the relation between humans and technology in the organisation, Ciborra (2004:26) uses the metaphor of technology as a guest. As such technology is invited into the organisation and has to be treated with respect and hospitality. The host has to adapt his/her actions in order to accommodate the guest. According to this metaphor, humans remain firmly in control of organisations because they have to determine the terms and duration of the guest’s stay. The guest has a right to visit, but not to stay (Ciborra, 2004:27). While the host serves the guest and its identity could be changed by the guest, it should not allow the guest to dominate and take control. As owners, we humans should be able to say yes or no to technology (Heidegger, 1977), or to “drop our

tools". System development methods "are just the external appearance of a ritual imposed by the human host" (Ciborra, 2004:28). We find in this account of Ciborra a nuanced view of the relation between the human and the technological, but ultimately one in which only human agency is acknowledged. The allocation of the role of guest to technology which is dependent on the hospitality of the human host, denies the profound and necessary role which technology plays in the constitution of the network.

Where the ANT concept of "rhizome" is similar to the notion of "drift", the attribution of actancy to technology provides another way to understand where the drift comes from without attributing it to unknown "dark forces". If the actancy of technology is acknowledged and if it could be traced, insight could be gained about the causes of the drift. Although it should be acknowledged that practical rationality (Ciborra, 2004) operates within the contingency of the situation, the heterogeneous nature of actants within the contexts provides a new perspective on the functioning of this kind of rationality. In order to say *yes* or *no* to technology assumes a discretionary space which is already partly shaped by technology. The response comes from a heterogeneous subject. A redistribution of actancy and of rationality takes place which includes heterogeneous subjects.

It seems that Rose & Truex (2000) still operate with a dualism of the human and the technical when they compare ANT and Structuration theory. Their claim that the latter attributes agency only to humans, while the former attributes agency also to machines, is a simplified account of ANT. The ANT account of agency is more complex since it attributes agency to a network that is always and already a hybrid. The "front" agent may be a human or a machine but these entities are the visible part of an underlying network which makes the actancy possible. It is not a matter of attributing strong or weak agency to machines, but of locating agency in a network which attributes strong or weak agency to particular entities.

The actant-role of technology goes further than Monteiro's (2004:134) notion of the domestication of technology. Although Monteiro comes close to describing an actor-network by showing the shortcomings of notions of the "use" of technology, it remains for him a human network within which technology is domesticated. This suggests a passive role of technology which is "ascribed" a (symbolic) role, and

“cultivated as part of our self-identity” (Monteiro, 2004:137). In this account technology cannot contribute actively to the shaping of the network in a way that might exceed human attempts to domesticate it. The concept “domestication” assumes that the pure human household already exists, that technology is “incorporated” and that the household remains basically the same. The same goals in the households are achieved through different means. In contrast, ANT sees the role of technology as much stronger because it contributes actively to the redefinition of the household which is cohabitated and co-shaped by humans and technologies. It is possible for any network to be assembled in such a way that certain entities are domesticated through enrolment. This is, however, not only the case with technologies, but could also apply to humans who are “configured” (Woolgar, 1991a).

It has to be taken into account that technology never operates on its own, but is always part of a network. The actancy is therefore also not automatically given, but allocated and distributed by the network. The substantial actancy which Winner (1986) attributes to the technology of the atom bomb, should be traced to the relevant networks. The “trans-historical” and “cross-contextual” characteristics of technology in Kallinikos’ (2004) network are effects of the particular networks within which it functions and could be traced empirically. These characteristics do not portray an essential nature of technology, but are contingent outcomes of a particular network. The fact that users have to be trained refers to their enrolment within a particular network of which technology is a part. In this process they have to assume a new identity and acquire new interests and roles. Simultaneous with the introduction of technology into a new context, is the extension into the new context of the network within which the technology was initially developed. The “determinism” does not lie within technology itself, but in the particular role it came to play within the network.

As an actant in the actor-network, technology has effects which cannot be attributed to any other entity. It therefore has to be taken seriously as a contributor to the network and its role in changes, stability and distributions has to be carefully and critically traced.

4.2. Programme of action

While we have seen (Chapter 4, Subsection 4.1) that networks are constituted through programmes of action in which different entities are associated, we are now in a position to elaborate on the role of technology as a “gathering” in this process. The presence of anti-programmes can now also be related closer to the design of technology.

In the development of the programme of action various kinds of obstacles or anti-programmes have to be countered. In order for the Portuguese vessel, the *Carreira*, to be mobile and durable, it had to withstand attacks from small boats, adverse winds, sea currents, etc. By incorporating into the design an answer to these anti-programmes the boat was able to sail far from the land and independent of its environment (Law, 1986:238). The answers to the different anti-programmes result in a more complex design. More complex programmes of action also contain sub-programmes (Latour, 1999b:209). The response to the anti-programmes is not only a way to overcome external obstacles, but also to incorporate what is outside into the network. The Portuguese’s attempt to find a trade route to the Indies required the assembly of a complex network in which were enrolled heterogeneous elements such as men, sails, wind, currents, etc. (Law, 1990). The response to the anti-programme requires a technological detour which consists in the enrolment of another element within the network. The Other (wind) is incorporated in a way that it seems absent (Law, 1986). This invisible incorporation of adverse elements into the design gives the appearance that the vessel is isolated from and independent of contextual fluctuations. This leads to the notion of the black box where it appears to become a self-referential and autonomous entity. Although technology appears independent and isolated, it contains within itself various adverse forces whose power it succeeded to tap and whose existence it appears to suppress. The “context” of the collective is the various anti-programmes it encounters and in reaction to which new elements are enrolled and qualities translated to them.

Latour (1994:247) described the programme of action embedded in the car seat belt which is designed in order to accommodate the contradictory requirements of being simultaneously firm and elastic. One should be able to move forward, but not too quickly, etc. All these conflicting requirements are mediated through springs and

latches. Law (2002) also illustrates this with the way an aircraft is designed in order to counter attacks by hostile aircrafts. It must be able to fly low at high speed and in such a way that it remains stable. Technology contains an answer to the possible and real anti-programmes that threaten to destroy it. The power of technology is enhanced in the way it responds to a variety of potential destructive anti-programmes in the execution of an own programme of action.

4.3. Reversible forces

The power of technology also comes to the fore when the way forces are reversed is recognised. Latour (1988b:299; 1994: 228) states that "...techniques are always involved when asymmetry or irreversibility is the goal", when the small becomes stronger than the large. It enables the transformation of a major effort into a minor one through the processes of displacement, translation, delegation and shifting (Latour, 1994:229, 231). A large effect is achieved with minimal input. In his study of Pasteur, Latour shows how such a reversal takes place in the technology of the laboratory where the hierarchy of forces is inverted (1983; 1993:271). What is a large force outside the laboratory, such as a devastating virus, can be changed into something controllable inside where multiple occurrences with limited variables of an event are created. The laboratory as technology makes it possible to "sum up" more mistakes than what is possible outside the laboratory.

A classical example of the reversible force of technology is portrayed by Winner's (1986) account of the low overpasses of the bridges on Long Island, New York, designed by Robert Moses. The effect for generations to come of this one design was that buses, used by blacks and poor people, could not access Jones Beach. An example of the political impact of such a reversal of forces, as discussed by Latour (1993:110), is the way the king of Syracuse used Archimedes' invention of the lever to produce the catapult with which his enemies were subjected. Another example is provided by Orlikowski (1991) who describes the effect of a technological "production tool" in the work of software consultants. In this case the effect relates to the number of consultants per manager:

But now with tools, SCC is in the factory business, so we want to have as high a leverage as possible, up to fifty people per manager. The average right now is about twenty people per manager, but we can do much better. (*ibid.*, p.25)

With tools we can make money leveraging people, that is, having many bodies even at lower rates can be profitable with tools. Tools allow us to do what we are always trying to do in SCC, to push work down to the lowest skill level possible. They allow a factory mode of operating. (*ibid.*, p.27)

We use tools to leverage people's skills. One person who is more skilled than everyone else does the program shells, and then you can take people who are less skilled and they can use those shells. So we don't reinvent the wheel. And instead of everyone having to get the same level of skills, we only need a few people with the higher skills. (*ibid.*)

The lever could be seen as the archetype of the way technology produces the maximum effect with the minimum effort. The examples show that the reversal of force has political effects, or could be used for political purposes (Latour, 1994:229). In order to establish what forces are being reversed, or "every time you want to know what a non-human does, simply imagine what other humans or non-humans would have to do were this character not present" (Latour, 1994:229). The hinge of a door, for example, replaces the work of breaking down and rebuilding the wall whenever one wants to be at the other side of the wall. This effort of breaking down and building up is replaced by a simple device that uses a minimal amount of energy and time. The simple device of a hinge therefore contains all the power and energy it replaces. Technology provides a way to accumulate tremendous power. It could put the weak in a position where it overpowers the strong. Through this reversal, technology makes a unique and problematic contribution to the network (Latour, 1993:111).

The powerful effect of the folding of time is clear when an action of a long past actor is preserved in the present resulting in an asymmetry between the absent maker and the present users (Latour, 1999b:189). Once a groom is installed it does not need constant attention. The absent initiator is still present in the effects of the action mediated by technology (Latour, 1994:231). In a similar way forces are reversed over a distance carried by the "immutable mobile".

Forces are reversed when the small becomes big through the enrolment of technological devices that are able to store power. This is the case with the Portuguese vessels which collected the power from the environment such as the wind or the currents and used the power as a resource (Law, 1986:240). These elements became enrolled as obedient servants in the network. The environment

could therefore not be seen as simply hostile to the network or as a constraint, but, once enrolled, it became a resource from where power was being collected.

Translation refers to the process where the power of an entity is extracted and used for a different purpose:

As I have suggested, they made it possible to use the winds in ways that had not earlier been possible by transforming those that might previously have been dangerous, or simply adverse, into forces that contributed to the projects of the Portuguese by bringing their vessels towards their destinations. (Law, 1986:240)

In a similar way Law (1986:255) explains the hegemony of the West with reference to the “durable and mobile documents, devices and people”. Technology is the device which collects such power at one spot through the multiple inscriptions and translations of various entities. The strength does not only refer to the technology as such but to the alignment of the network as a whole (Monteiro & Hanseth, 1996:6). A network is strongly aligned if entities are well enrolled in the program of action and the interests well translated. The collected power is also dependent on the strength of the inscription and prescriptions.

While technology has the ability to reverse, collect and store a large amount of power, it does so mostly in an invisible and silent way (see Subsection 2.7 above). The power of technology is characterised by its unobtrusiveness and invisibility. The delegation of a prescription to a machine removes it from the sphere of articulated discourse.

The result of such an alignment of setups is to decrease the number of occasions in which words are used. (Latour, 1994:240)

The “shifting out” to technology is done in a silent way,

machines are not talking actors, not because they are unable to do so, but because they might have chosen to remain silent to become agreeable to their fellow machines and fellow humans. (Latour, 1994:249)

For Bowker, Timmermans & Star (1996:345) “[v]ery large information systems such as the Internet or global databases carry with them a politics of voice and value which is often invisible, embedded in layers of infrastructure”. The combination of power and silence/invisibility makes technology an important factor to contend with in

the unravelling of a network. It leads to technology being easily overlooked in the explanation of change and order.

5. Change and order

Both change and order are powerful effects of technology in the network. The opportunities for change do not simply lie in the autonomous and free human ability to choose differently under all circumstances (Giddens) because we are deeply embedded in technologies which mediate the opportunities for thought and action. We have seen that volition and intention are affected by the mediating role of the technologies which surround us. It is not possible to shift ourselves to a non-technological position in order to act in a purely human way. Furthermore, the intention to act differently does not translate directly into intended results once these intentions become mediated by technologies.

In relation to the role of technology in the network, this section describes the contribution of technology to change and order. The careful tracing of change is important because it reflects the shifts that took place through translation and mediation. It is also important to establish how a network becomes stable or fixed and which changes became entrenched. Whereas change relates to the existence of different real possible programmes of action, stability refers to the reduction of these possibilities and the dominance of one.

In answer to the central question of sociology about the origin and the stability of society, one has to understand the role of technologies. The social is not maintained simply through social means, but mainly through nonhumans such as technology. It plays an important role in the constitution and maintenance of the network. With reference to theories in science about the substance the universe is made up of, Latour asks about the elements that keep society together. He argues that technologies are these “missing masses” that account for the chains of delegations in the network (Latour, 1994:244) through which stability is achieved. When these nonhumans are removed, the existence of society becomes incomprehensible because its size, its durability and its solidity no longer have a cause (Latour, 1993:111). The stability of the networks should be attributed to the many techniques being brought into play and which hold everything together and in place. The many

techniques involved in social relations create stability (Latour, 1999b:209). Functions and roles are allocated to durable entities and kept in place.

5.1. *Irreversibility and durability*

Irreversibility refers for Callon (1991:159) to the point in the network where it is impossible to go back to a stage when different possibilities existed and to the extent that a particular state “shapes and determines subsequent translations”. Whereas any network is the result of multiple negotiations and translations, it remains fragile in so far as it is only dependent on human relations. Humans often reverse their agreements because they can and often do go back on their word, or forget what they committed themselves to. Reversibility is not so easily achieved once the negotiations and translations are written into things. “The involvement of nonhumans resolves the contradiction between durability and negotiability” (Latour, 1999b:210).

The role of technology in the network becomes clear for Latour when he compares the studies of Strum on baboon society with human society. The baboons have developed a complex range of social skills to maintain the place of everyone and the cohesion of the group (Latour, 1999b:210). For us humans the purely social relations are too weak to maintain society and we are not as socially able as baboons. The human society cannot consist of only social (human-human) relations because these relations are too weak to keep the social together. Relations, power, hierarchies have therefore to be translated into the durability of material and technological objects such as institutions, machines and laws. It is important for the human society that the kind of associations should “last longer than the interactions that formed them” (Callon & Latour, 1981:283).

In order to stabilize the social, “unsettled alliances” must be replaced with “walls and written contracts” (Callon & Latour, 1981:284). “Nonhumans stabilize social negotiations” (Latour, 1999b:210) and introduce an element of durability. The durability of the techniques ensures that social interactions do not have to be renegotiated every time humans interact. The social contract which makes human society possible would not remain if it were not for the documents giving material form to it. Each performative definition of society is reinforced, underlined and

stabilised, by bringing in new and non-human resources (Latour, 1986:276). “Power’ is now transferred to the many resources used to strengthen the bonds”.

Technology is one of the entities that brings an element of stability and durability to the network since they can be shaped easily and “lasts longer than the interactions that fabricated them” (Latour, 1999b:210). Once a prohibition is built into a speed bump, it is harder to go back to a previous situation where people could drive as fast as they wanted. Irreversibility and durability are obtained in society through the multiplication of associations which transform the “pliability of a situation into an irreversible fact” (Callon & Latour, 1992:365). With regard to Robert Moses’ bridges on Long Island, the effect of the inscription of this prejudice into concrete stayed as long as people were dependent on bus transport (Winner, 1986). Orlikowski (1991:35) explains how inflexible the rules of the consultants became once they were inscribed into programming code. Hughes (in Monteiro, 2000) uses the notion of momentum to refer to the way infrastructure technologies become self-reinforcing systems which are larger and more complex. What ANT does is to describe how the system becomes larger and more complex through the processes of assembly and alignment.

The role of technology in the achievement of irreversibility and durability is further strengthened when prescriptions become inscribed and sealed in the metaphorical black box. The notion of a black box suggests that technology is a closed entity where the inner workings are impenetrable. It testifies to the way forces are collected in invisible and silent ways. “A black box contains that which no longer needs to be considered” (Callon & Latour, 1981:285). It represents a stage in the development of technology where the different possibilities and choices are eliminated. It contributes to the opacity and complexity of the network when the black boxes are piled on each other. Black boxing is an essential component in the growth of the macro-actor who obtains more power by casting some associations in the form of a black box that makes them last. Once an association is cast in black boxes, it does not need to be renegotiated every time, but could be employed in negotiating the next association. It is the creation of lasting asymmetries of power (Callon & Latour, 1981:285). It hides “the continued exercise of a will to give the impression of forces that move by themselves” (Callon & Latour, 1981:285). Monteiro & Hanseth (1996) provide a good illustration of this process with the establishment of IS standards. Once these

standards are set, they become a typical black box since the prior negotiations disappear from the view and they exert a determining influence on subsequent developments.

The characteristics of irreversibility, black boxing and durability result in the “immutable mobile” which refers to the ordering over distance. The technological object can be transported to another place and time while the inscriptions and prescriptions remain intact. It fulfils the same function relatively independent of the immediate environment. In this way it obtains the characteristics of autonomy and self-referentiality. Law (1986) describes how the Portuguese succeeded in exercising “long-distance control” through the mobility and durability of vessels. The expansion and maintenance of power is not limited to physical proximity, but could be exerted in a relatively stable way over a distance. The vessel meets the requirements of long-distance control because of its mobility, durability, the ability to return and to enable communication that is undistorted. The immutability refers to the static way in which it collected various forces such as currents, the wind and astronomical skills. It is “undisturbed by their external environment only so long as they were able to transfer that environment inside themselves in the form of charts, rutters and the rest” (Law, 1986:243). This is not only the case with a vessel on sea, but also with instructions or communication which “comes back” in an undistorted way (Law, 1986:240). The immutable mobile illustrates how power is exerted through technology in such a way that what is remote and on the periphery is made to respond to the centre (Law, 1986:241).

Although the immutable mobile looks like an isolated entity which exercises its own power, it carries within itself the networks of its origin without which it could not function. As long as it is accompanied by this network, it continues to exercise power over time and space. The effect that the immutable mobile achieves is therefore that of the network it belongs to. The movement of the immutable mobile is part of the rhizomatic spreading of the network. By exporting the black box to a new location, the associations inscribed into it are extended. The remote location is therefore attached to the original network. It is therefore not only the technological object that is transferred, but the original network itself is expanded to the second one, or the second network becomes a marginal part of the first one. That is why people in the second network have to be trained to use the technology correctly. The appearance

of a self-sufficiency and independence of the black box is an illusion which hides the attachment with the network of origin from where it gains its durability. The automatic door groom would not function any more if the rest of the network is not aligned, such as when the building becomes deserted or if people do not come to the door any more (Latour, 1994). Durability is therefore not an automatic given, but needs to be supported and maintained as part of a network.

The notions of irreversibility and black boxing through technology suggest that technology shares the material stubbornness of natural objects. These characteristics of technology underlie conceptions of technological determinism and substantive views of technology. What these views do not adequately take into account, is the way these characteristics are effects of network-actants and not simply of technology by itself. The notions of irreversibility and black boxing could also be used to explain how institutions come about (Latour, 1999b:155-6). This is not recognised by Monteiro & Hanseth (1996:12) who claim that ANT cannot account for the relation between institutions and actions. From the current perspective, however, institutionalisation should be seen as a particular stage in the alignment of an actor-network.

5.2. *Transforming the network*

Whereas the notions of irreversibility and durability refer to the stability of the network, technology also plays an important role in change. As a mediator and translator, technology is always part of a plan of action through which networks are continually changed. This takes place through the birth of new entities, the changes of essences and the establishment of new associations. In the design of a programme of action, competencies and actions are distributed among humans and nonhumans depending on their reliability and skill. Actions are inscribed in nonhumans and prescribed to humans. In this process, technology contributes to the construction of reality. These are typical innovative engineering processes where a programme of action is executed in opposition to anti-programmes by aligning entities, redefining essences and allocating roles. This takes place through delegation and prescription, and negotiation with both humans and nonhumans. The engineer substitutes one type of delegation for another regardless of whether the actant is human or non-human (Latour, 1994:244).

Technological innovation is the design of a programme of action in which the following happens:

- the addition of new beings
- the passage of an actor from program to anti-program or, vice versa
- the change in the state of an actor
- the substitution between beings
- routinization (Latour, 1995:279).

Technology would not have been possible if only essences existed (Latour, 1995:278) and if the nature of humans and things were unchangeable. Although entities turn at times into essences (black boxes) it could be changed through technologising. Latour explains that “things are not stable, but people are much less stable still” (Latour, 1995:277). He explains how identities and interests are changed in his discussion of the work of the engineer in relation to the door, the cat flap, the seagull and the person concerned about drafts. In the process the engineer devises technological means which renegotiate the identity and interest of each one involved. In this process a new network is established in which the nature of the door and the window, and the interests of people and animals are changed. The engineering process consists of establishing and negotiating the changeability of essences. The door is not any more just an entity used to close a gap in a wall in such a way that people could easily open and close it. It now also fulfils these functions in such a way that it does not obstruct the passage of a cat. Technological innovation does not only create an environment in which existing identities and interests could be maintained in an unchanged way, but it contributes to changes to all entities involved.

Bowker, Timmerman & Star (1996:351) confirm this with their study of infrastructures in organizations: “New infrastructures do more than support work which is already being done - they change the very nature of what it is to *do* work and what work will count”. Bloomfield & McLean (1996:374) refer to the cognitive aspects of IT when they state that “...the ways in which thinking about the world in terms of information and information processing changes our conceptualization of ourselves and the world around us”. This is further illustrated by the authors with reference to the way

communication with a patient is shaped by the need to complete a form⁸. The technology of the form exerts a kind of actancy that shapes the ways and means of the communication. To the initial purpose of processing information effectively is added a new definition of knowledge as that which could be processed by a form. In this process other kinds of information may become invisible or lost. Orlikowski & Scott (2008:39) describe how the technological routinizing in banking in the UK has led to the possibility that “the future British economic landscape may have been changed without anyone’s consent”. Orlikowski (1991:34) shows how the introduction of a “productivity tool” for consultants shapes the “assumptions and mental models that workers draw on to understand and accomplish their work”.

The network refers to the interaction between the different elements from where their identities arise. Neither humans nor technologies enter the network as predefined and fixed identities.

Actor-network theory rather incites us to reconsider sociotechnical relationships as an open ended set of interactions where the actors of the sociotechnical interplays do not pre-exist the relationships; the actor is generated in and by these relationships. (Cordella & Shaikh, 2003)

Although technology is part of an engineering plan of action, it cannot be foreseen what the effects would be or what technology gathers at a particular point in time. In their research project Ciborra & Hanseth (2000) show how the attempt to control organisations, also through infrastructure, leads towards drift where the outcomes are unpredictable and where

infrastructure tends to ‘drift’, i.e. they deviate from their planned purpose for a variety of reasons often outside anyone’s influence. (Ciborra & Hanseth, 2000:4)

6. Conclusion

This chapter traced the ANT view of technology and the relation between the technical and the social. The characteristics of technology have been identified as well as the significant roles technology plays in the network. Once the constructivist and instrumentalist views of technology are discarded it becomes possible to

⁸ This case study is discussed in detail in Chapter 7, Section 4

appreciate the kinds of roles played by technology. A distinction could be made between the modus in which the roles are played out, and the substantial influence of technology. As far as the modus is concerned, technology operates pervasively, silently and powerfully. In relation to the substantial influence of technology, it contributes both to change and order in networks. In relation to changes it shifts identities and interests in unpredictable ways and contributes to distributions. In relation to order it ties identities and relations down and freezes them. It could shift the most well entrenched identities and relations and it could tie them down so that they appear to be unchangeable. Technology is also a powerful force of stability in the network and provides the means through which a network could consolidate its present state as a basis to extend itself.

The implications of the extension of the notion of actancy to nonhumans for a critical conception of technology are that the number and nature of actants are drastically increased. The account of the central and powerful role of technology in the network provides the backdrop for the investigation of the critique of technology. It is clear that the pervasive role of technology would be ignored at our own peril and that a critical investigation is needed of the subtle, silent and powerful ways in which our world is shaped through technological mediation.

We have seen that the role of technology could be understood in the powerful and irreversible way in which it contributes to change and order. Since technology could not be seen in a substantive way, it does not cause or determine any predictable result. The outcomes to which technology contributes are an effect of the heterogeneous network as such and could not be attributed to a single entity within the network.

This chapter attempted to be specific about the kinds of roles technology plays in networks. Whether these roles are problematic will be established when the following chapter investigates ANT's conception of critique.

An ANT Conception of Critique

1. Introduction

Chapters 5 and 6 provide an interpretation of an ANT view of technology and critique respectively. These interpretations follow from the general account of ANT provided in Chapter 4. These two chapters should be juxtaposed with Chapters 2 and 3 in which the accounts of technology and of critique in CRIS are provided. It is important to understand ANT in a holistic way by locating conceptions of technology and critique against the background of main ideas of ANT. While the importance of the critique of technology already transpires from the discussion of the ANT conception of technology, this can only be further elaborated after an adequate overview has been provided of an ANT conception of critique.

In order for critique to become a possibility one has to shift from the analytical-descriptive account provided thus far, to a normative one. Critique is a judgement, motivated by a notion of a more humane society, that some state of affairs is deficient in some way and that it should be different. ANT goes about the critical process with great caution since it aims to avoid the evaluation and judgement of any particular actor-network from a position that claims a moral or epistemological higher ground. Critique cannot come from a meta-position outside the network as is the case with most critical theories.

Although ANT does not stand in the traditions regarded as “critical” it will be indicated that an approach to critique is made possible that avoids the modernistic narrative of emancipation and the postmodern multiplication and fragmentation of narratives. It is argued that ANT is fully compatible with the various elements of critique as identified in Chapter 2 because it is fundamentally interested in the way power is assembled and maintained, in the morality of the network and in processes of transformation. ANT wants to make a difference by focusing on the mechanisms through which the powerful gain their position. Because of the methodologically neutral way in which ANT goes about this, it does not directly employ judgemental concepts such as oppression, exploitation, contradictions or alienation to describe the status of marginalised entities in a network. It will be indicated that, although apparently neutral and non-committal, ANT does provide a deeper and broader form of critique than the critical traditions discussed in Chapter 2. ANT also provides a notion of the activation and enablement of the agents responsible for transformation.

Critique is a strong underlying motive in ANT. This motive in ANT comes to the fore in the statement of Latour that the

goal of our philosophy, social theory, and morality is to invent political institutions that can absorb this much history, this vast spiralling movement, this labyrinth, this fate. (Latour, 1999b:214)

The “political institutions” that must be “invented” refers to the processes and procedures that must be found where all entities could participate in the establishment of the world. The “spiralling movement”, “labyrinth” and “fate” refer to the increasing intermingling of the human and the technical to such an extent that the artefacts do not merely mediate us, but “they are us” (*ibid.*). If the “us” are so expanded, the question is then how do we live together and what is the role of critique in this new democracy? It will be indicated that these are not two separate questions because the procedures through which the network is to be established, provide the normative means to evaluate any such gathering. The account of ANT in the previous chapter is valuable for an understanding of critique because the ANT approach to critique is already implied in the way it describes and analyses the network. A form of critique is developed that does not have an anchor point or transcendental principle as court of appeal, but which draws on the subject positions of those inside the network.

The aim of critique is to increase the morality of the network. This is not a morality in accordance with transcendental moral principles of freedom and autonomy. ANT contains a deeper sense of morality and commitment by questioning the effects on an entity once it becomes enrolled in the programme of action of another. The moral judgement has to be done from the perspective of those affected by distributions in the network.

ANT provides a set of descriptive and analytical tools with which to analyse the network critically. The concepts differ from the critical concepts such as race, class, gender, capitalism and colonialism in the sense that they do not provide a particular or singular perspective on the network. The kind of critique that is made possible is not definitive but tentative and suggestive. The critical task is to trace how the network is contingently put together and how heterogeneous elements are brought in relation with each other. The main focus of critique is to establish how power is collected and maintained, how interests are translated and distorted, or how entities are boxed in (Law & Bijker, 1994:292).

ANT mainly provides a set of methods, techniques and strategies to investigate the assembling process. In the process it focuses on *how* these processes take place and what the effects are, and not so much on the question of *why* it happens (Law & Bijker, 1994:292). Where the *why*-question refers to an underlying plot and requires a meta-narrative that allocates motives and beliefs, the *how*-question is interested in the ways the network is being brought together, how it is maintained and what the costs to those involved are. The *how*-question focuses on the way power circulates and becomes concentrated at a certain point, and on an investigation of the effects of this power. Whereas the *why*-question speculates about intentions, the *how*-question enables an empirical tracing of the assembling processes. The underlying effect and motive of critique is to present the seemingly powerful and homogeneous as fragile, multiple and contingent by showing that the way things are put together is not permanent and closed. Critique always implies that the network could have been configured differently, but does not prescribe how different it should be. Critique makes it possible to imagine it differently. It identifies the openings in the network which provide opportunities for resistance.

With reference to the three elements of critique identified by Alvesson & Deetz (2000) (interpretation, critique and transformation), the focus of ANT is closest to the first element. The problem, from an ANT perspective, is that critical thinkers jump quickly to the critique and transformation without an adequate understanding of how a network is constituted. The ANT approach to interpretation focuses on the ways in which the network is composed and maintained. The insight gained is not conclusive or unambiguous, but complex and contestable.

It is true that many ANT studies do not explore its critical dimensions explicitly. Star (1991) points to the limitation in (initial) ANT analyses which focused more on the composition of powerful assemblies through powerful actants. This comment applies to studies such as Callon's (1986b) account of the scallops in St Brieuc Bay which shows how the scientists strategise to enrol other entities in their network. It also applies to Latour's (1988a) account of the network building activities of Pasteur, or Latour's (1994) account of the hotel manager who enrolled the guests in a network that makes them hand in their keys before leaving the hotel. All these accounts focus mainly on the central actant who coerced others into a dominant network. If one were to focus on critique, however, these studies contribute to an understanding of how power was accumulated and extracted from others through the shifting and fixation of identities. These studies demonstrate already how ANT could identify and describe the mechanisms of how many small translations affect a network that is not as tightly woven as it appears.

For critique to hit the target, it is crucial to identify the different forms in which actancy appear, the multiple ways in which entities are enrolled in the programmes of action of others, and the subtle and silent way in which humans and nonhumans become part of punctuated systems. Critique is not possible until it is established who or what the actants are and how the actancy of some relates (diminishes, distorts, is dependent on, diverts) to the actancy of others or how the network places some actants in a marginalised position.

Finally, we found here a version of critique that is much more modest than what we are used to in the critical approaches. Whereas the critical thinker is often placed on a moral and epistemological higher ground, it becomes in ANT a much more humble activity. Latour regards the chances for critique to be effective very small:

[Critique] is not automatic, and most of the time it will fail. Two hundred pages of interviews, observations, etc. will not make any difference whatsoever. To be relevant requires another set of extraordinary circumstances. It's an event. It requires an incredibly imaginative protocol. As great, as rare, as surprising as Galileo with his pendulum. (Latour, 2004a:74)

This chapter starts with the difference between ANT's notion of critique and that present in modern and postmodern views. It is shown how ANT moves away from these two poles in an attempt to define a "nonmodern" position. Main elements of an ANT approach to critique are subsequently analysed in relation to the foci, purposes, strategies and effects of critique. Many of these elements reappear in a conception of the "democracy of things" discussion in subsection 7. This chapter then paves the way for an investigation into the critique of technology in the following chapter.

2. The poverty of modern and postmodern critique

ANT moves in significant ways away from the forms of critique presented in Chapter 2. Its challenge to the critical approaches in constructivism, critical theory and postmodernism lies in its belief that their approaches are "speceist" because they focus only on the role of human agents. Where critical constructivism locates the source of critique in (human) society, critical theory does so in transcendental rational principles, while postmodernism locates critique in the way people disintegrate the wholes into fragments. While ANT draws from these approaches to critique, it aims to target critique on the basic mechanisms of the assembling process.

An important element in the critique which ANT brings is not so much in the denunciation of other forms of critique, but in the notion that different forms of critique should be brought together. In this process, ANT shows how each brings a partial perspective and that a more comprehensive form of critique is possible. ANT does not attempt a synthesis of other forms of critique to overcome their differences. It would rather look for valuable critical insights through the juxtaposition of different kinds of critique.

2.1. *Constructivist critique*

Since human meanings are inscribed into technology, according to constructivism, they could be identified and articulated through the deconstruction of the technology. Since technology is seen as a pure social construction (Latour, 1999b, chapter 9), it is possible to revert to a time when pure human ideas and intentions existed before they became engrained and frozen in technological forms. Although the role of social and historical contexts is acknowledged (Klein & Myers, 1999:81) it remains important to emphasise the active role of humans who are not mere products of circumstances outside their control. By identifying exactly which meanings are designed into technology, the essential human form could be extracted and restored.

From the ANT perspective these ideas are fundamentally flawed because they assume that such an original human form could be found, independent of any form of technical mediation. These views fail to realise to what extent the human form is already shaped by technologies (Chapter 5, Subsection 3.3).

We have seen that description is an important element in ANT (Chapter 4, Section 2). This is not exactly the same as constructivist interpretation as described by Alvesson & Deetz (2000) because it contains the means to analyse the operation of power in the transaction between entities in the network. Interpretation in ANT is not simply a pre-condition for critique, but it already contains the critical elements within itself. It is therefore not necessary for ANT to go beyond the interpretation to uncover underlying structures as is the case with critical interpretivism. Since ANT includes the active role of nonhumans (such as “structures”) in its description, it does not have to suspend the tracing of the interpretive processes in order to uncover underlying determining structures. Critique does not simply lie in the uncovering of the “real” motives of actors against a structural context according to the principle of suspicion, but it is already present in all the seven principles of interpretive studies Klein & Myers (1999) identify. Critique is, for example, already present in the “hermeneutical principle” where the local narrative is offset against the global one. These are only two of the possible narratives which provide the means of critique (see Subsection 5.5 below).

2.2. *Modern iconoclasm*

We have seen in Chapter 2 that critical research is guided by the intention and purposes of the researcher to bring about change. Latour describes this attitude as a form of iconoclasm translated as ideology-critique in modernism. As a typical example of how this critique functions, Latour (1999b:270 ff.) draws on the fictional character Jagannath in the work of U.R. Anantha Murthy (Ray & Selinger, 2008) who wants to liberate the untouchables in India from his own high caste family by instructing them to touch the sacred *saligram*, the stone that protects his family. He assured them that, by touching it, they would realise it is only a stone and they would be liberated from their false beliefs in this fetish. For Latour this action is typical of the iconoclasts who place themselves in a position from where they could identify and uncover the naïve and false beliefs of others while themselves escaping from such beliefs. The iconoclast labels those it criticises as “fetishists” and accuses them of a naïve belief in the power of inanimate objects. The oppressed could be liberated if they were only to see the object for what it is, a mere stone. In the eagerness to free the “natives” from their false and naïve beliefs, the iconoclast actually undermines the humanity of all involved. The stone is not just a fetish with magic powers, but a “thing” which gathers the social structure. Latour indicates that beliefs and objects cannot simply be destroyed because they are judged to be false from the belief system of a critical theory. Critique has to go about with much more caution. It cannot be rendered without a full appreciation of the delicate coherence of a network. What is also problematic about the iconoclast is the belief in the finality of a particular perspective by claiming epistemological and moral privilege and by projecting others in a position of absolute ignorance. In this process the iconoclast is the one that creates and destroys the false object. The devastating effect of this critique is that it removes human agency twice “by disintegrating entities into mere beliefs and solidifying opinions and positions into hard facts” (Latour, 1999b:276). In this way the modernist undermines the very possibility that agents could critique and transform their own situation.

A similar form of critique takes place in traditional forms of the critique of technology. Users are accused of having become the instruments of technology in that they cannot reflect critically on the way they are dominated by others. Their interpellation by the technological object prevents them from grasping the extent of their

alienation. They live in a “false consciousness” because they are unaware of the contradictions that oppress them. Such a conception of critique is inherent in a view where technology treats everything as a resource and where (human) users are positioned as exploited objects. One of the central problems with this form of critique is that it fails to acknowledge to what extent the position from where critique is rendered, is already mediated through technology (cf. Latour, 1999b:274). The critique of technology claims to be rendered from a purely human perspective, but is already technologically mediated.

Latour does not want to be known as “critical” in this sense (Latour, 1999b:268). His response to the iconoclasts is to “*suspending* the crushing blow of the hammer” (Latour, 1999b:268). Latour’s advice for critical theorists is that critique must not be expanded, but suspended. Latour (2002b:25) comments in the introduction to a physical exhibition on iconoclasm⁹ as follows:

This is why this exhibit is also a *revision of the critical spirit*, a pause in the critique, a meditation on the urge for debunking, for the too quick attribution of the naïve belief in others (...). The devotees are not dumb (...). It is not that critique is no longer needed, but rather that it has, of late, become too *cheap*.

One should not render critique too quickly because the vantage point of critique is either denied or uncritically accepted. The position from where critique is rendered is not carefully investigated. ANT cautions us that a critical attitude should not be too quickly employed so that something that is built up with great care is not destroyed by the critical spirit. The networks which are the object of critique constitute the real, and, since they are usually carefully constructed, their collapse would mean a loss of reality. This collapse is a possible consequence of the current hammering critiques. The care which ANT proposes has, however, important critical dimensions because it centrally tests the morality of the network. While networks must be analysed with a sceptical mind to trace the rhizomes of power, care must be taken not to simply destroy and overthrow, but to respect how things are being held together.

⁹ This refers to an exhibition, Iconoclasm. Beyond the image wars in science, religion, and art. ZKM, Karlsruhe, 4 May – 4 August 2002.

2.3. Modern dualisms

From an ANT perspective, the basic problem with modern and postmodern forms of critique is that they hold on to various kinds of dualisms where things are kept separate, such as human/technology or nature/society. Modern critique attempts to identify the purely human in order to establish to what extent it could be enhanced by or liberated from technology since hybridity is already a form of alienation. A good illustration of this modern dualism in Habermas and Beck is provided by Whitley (1999).

Latour (1993) points towards the problematic nature of modern critique that employs six 'courts of appeal' in a contradictory fashion. They hold simultaneously on to both the immanence and transcendence of nature, society and God. An appeal is made to the transcendence of nature to criticise the 'obscurantism of power' (Latour, 1993:43); an appeal is made to the immanence of society to warn against human submission to natural forces and determinants; human prejudice is criticised on the basis of the (transcendent) laws of nature (Latour, 1993:35); subjective truth (immanence) is criticised on the basis of an objective nature; objective truth is criticised on the basis of subjective truth (Latour, 1993:38); any trace of human freedom could be criticised with reference to the laws of society and the economy; an attempt to pose a transcendental value is criticised on the basis of social constructivism (Latour, 1993:38); on the basis of precise knowledge of society provided by sociology, it was possible to criticise the biases of the natural sciences (Latour, 1993:35); critique draws simultaneously on the transcendence of society to show the bias of natural sciences and it draws on the transcendence of nature to show the bias of society. The impossibility of the modern critique lies in the way they hold on to the transcendence and construction (immanence) of nature, culture and god, and to the freedom of society/humanity in the rendering of different critiques (Latour, 1993: 38).

In addition, the moderns and postmoderns use three different strategies of critique: purification, autonomisation of language and the deconstruction of Western metaphysics (Latour, 1993:67). The critique of quasi-objects is based on the identification of pure forms (Latour, 1993:78). The moderns also draw on four resources of critique: naturalisation, sociologisation, discursivisation, forgetting of

Being¹⁰ (Latour, 1993:67, 127). The basic problem with these shifts in the basis, strategies and sources of critique is the lack of consistency. Although the moderns appear to be invincible because of the way the critique forms a closed circle (Latour, 1993:36), the contractions actually undermine the credibility of critique, it makes critique “run out of steam” (2004c). If all these angles of critique are simultaneously taken into account, it seems to be a relativistic enterprise, which would as such undermine the possibility of critique from a modernistic point of view.

One form of this dualism is the separation between humans and technology. The purification of the human refers to the basic belief underlying most of the critical approaches to separate these entities. The critique of technology is conditioned on such a clear distinction which is blurred by ANT’s notion of symmetry. According to modern views, the ANT notion of hybridity and symmetry makes it impossible to distinguish the unique human voice. If the distinction between humans and nonhumans cannot be made, according to the moderns, humans cannot gain critical distance from nonhumans. The critique of symmetry assumes that, since no *a priori* distinction could be made between humans and nonhumans, there is nothing that prevents humans from being treated in instrumental ways as machines. In most critical theories, critique is seen as a uniquely human facility and critique focuses on the dominating and alienating effects of technology. Furthermore, the notion of symmetry removes any recourse humans may have to dignity, freedom, protection.

Walsham (1997:475) illustrates this with reference to “IT-enabled warfare” or the “IT-based vision of the virtual organization where an objective central group controls the company’s global operation, moving people, jobs and societies like pawns on a chessboard”. The suggestion is that IT contributes to this and that the notion of symmetry prevents the victims from recognising their domination and exploitation. Once humans are seen to be part of a hybrid network, it is not possible for them to establish how their nature has been affected by technology. For Walsham (*ibid.*) the ‘exclusivity arguments’ of ANT is the most problematic. It entails that ‘social

¹⁰ The four resources refer to critique based on the sciences, social constructivism, postmodernism and on Heidegger. ‘Forgetting Being’ refers to Heidegger’s (1962) critique of the modern era where the deepest meaning of Being is forgotten.

structure' lies in the 'heterogeneous material arrangements' to the exclusion of 'memory traces and their implicit social structures'. Walsham works here with the dualism of the material and social which ANT wants to overcome. He seems to think that ANT chooses the material/local side of the dualism to the exclusion of the human/universal. Since ANT sees all larger systems as the outcome of multiple local assemblies and as the summing up of multiple localities there is no dualism of local/universal and no exclusively local for ANT. The notion of 'material heterogeneity' refers to the human and nonhuman together and not just to a pure materiality. Material heterogeneity is therefore not exclusively material. Walsham's notion of 'exclusivity arguments' is therefore based on a misunderstanding of the way ANT attempts to overcome the dualisms.

In a similar way, Collins & Yearley (1992a) argue that the possibility of critique is undermined when the crucial difference between the human and the nonhuman (nature, technology) is not recognised. They target in particular the dominance of natural scientists who claim access to an independent nature from where society could be criticised. Since, in their view, symmetry implies that humans and nonhumans are the same, human actions are machine-like and nothing remains of the unique human characteristics or the ability of humans to critique technology. Also Mitev (2003:36) criticises the flatness of ANT, its ability to define the boundaries of networks, the inability to distinguish between different kinds of actors.

2.4. *Beyond modern and postmodern critique*

From an ANT perspective, these approaches to critique rest on a belief in pure categories of the human and the nonhuman. They do not realise to what extent the human form is already mediated by nonhumans and that no pure human perspective could be identified. It is therefore for ANT impossible for critique to rest on the purification of entities. In contrast to these dualisms, critique is enabled in ANT when things are being kept together in accordance with its monistic approach (Chapter 4). The "single grammar" that is being used for the description of the network is also the means of critique. It is indicated that ANT's answer to these dualisms lies in its methodological symmetry regarding the kind of actant, the size of the actant and in relation to morality. Through his denunciation of the modern form of critique, Latour

wants to show how the different forms of critique should be put together to function simultaneously in the same space and to inform each other.

In his critique of the modern, Latour does not want to revert to the pre-modern or to the postmodern. With the notion of the nonmodern he wants to avoid the categories according to which the others are typified. The expression 'we have never been modern' means that even the moderns relied on hybrids and never really succeeded to purify the social terrain. Even non-modern entities such as gods and fairies should be kept as part of the network (Bloomfield & Vurdubakis, 1999:632). A more democratic form of critique becomes possible once all these forms of critique are put together and relativised. While modern critique is characterised by the way it attempts to reveal false consciousness, distortions, and contradictions from a particular anchor point, ANT wants to relativise the anchor point without losing the ability to critique.

Latour does not want to accuse modern and postmodern forms of critique of false consciousness (Latour, 1999b:278) because they were well aware of their strategy of purification and of the multiplication of hybrid entities. In this he follows consistently his approach to any actor who always knows what they are doing. Latour does not take anything away from these forms of critique, but he wants to add to it. Critique, for Latour, has to combine the different sources and strategies in the same space. Critique has to draw on all these resources simultaneously. This process does not make critique more damaging, but adds a reflexive element which relativises and tempers it.

These resources (of critique) must be "pieced together and put together in shadowing quasi-objects or networks" (Latour, 1993:67). The reason for the combination of the four resources identified above lies in the fact that hybrid entities cannot be clearly identified as natural, social, discursive or forgetting being (Latour, 1993:38). "The only thing I add is the relation between those two different sets of practices" (Latour, 1993:40) purification and mediation. This is not a new kind of unveiling on the basis of another anchor. Whereas previous approaches to critique operated with a part of reality in the sense of an objective reality out there, a subjective reality in here, or a discursive reality, Latour wants to bring all these

realities together in his critique. The purpose of critique is to restore and add to reality by asking the questions how reality is constituted and maintained.

This retrospective attitude, which deploys instead of unveiling, adds instead of subtracting, fraternizes instead of denouncing, sorts out instead of debunking, I characterize as nonmodern. (Latour, 1993:47)

Whereas the modern critique is a form of denunciation, based on the need to be morally enraged, a deeper sense of morality lies in compromise and negotiation ...it is active and generous because it follows the countless meanderings of situations and networks. (Latour, 1993:45)

In his 2004 publication (Latour, 2004c) Latour repeats many of the themes in this earlier work. His approach to critique is defined in contrast to two opposing approaches which pose on the one hand the fetish of the object, and on the other hand the manipulation of the subject. The problem with both these approaches to critique is that they leave the subject powerless and naïve. Critique could not appeal any more to an essential human nature that is being “alienated” or “oppressed”. Critique should not attempt to purify the network by showing how the monsters, the hybrid entities, come into being to ‘contaminate’ the essential human nature.

Latour does not only target modernistic forms of critique, but also the critique inherent in postmodernism. Critique cannot be the postmodern process where voices are merely proliferated in an attempt to disrupt the network. Critique has centrally to do with the care of the network and need to look for what is constant. It is not a form of iconoclasm which merely destroys without knowing what exactly is being destroyed and how it is being repaired again. It is not simply a deconstruction which uncovers the conditions of possibility, because it is also interested in what holds the network together.

3. Foci

Different aspects of ANT’s conception of critique are discussed in the following sections. This is done in parallel with the analysis of aspects of critique in Chapter 2. This section deals with the foci (intentions, aims and targets) of critique. The following sections deal with the strategies and effects of critique. Within these sections the other aspects of critique mentioned in Chapter 2, will be addressed.

ANT makes a deeper and more comprehensive approach to critique possible than what one encounters in most critical approaches. It is not only interested in the principle of suspicion (Klein & Myers, 1999) which uncovers the hidden meanings of agents, or the identification of distorted communication (Ngwenyama & Lee, 1997), or in social contradictions. The deeper form of critique relates to the careful tracing of every transaction involved in the production of the macro-actor whether labelled in terms of gender, or class or race. The comprehensivity is suggested by the way ANT wants to bring different forms of critique together. The tracing of objective laws are as important for critique as the effects of human subjectivity as long as they have an effect in the network. Doolin & Lowe (2002:74) find the broadening of critique in ANT's "reflexive and empirical enquiry" which unravels the "heterogeneous materials".

ANT focuses on the growth of the macro-actor and on the ways in which distributions take place in an attempt to show how tenuous the associations are that make it up. In this process it aims to show that alternatives are possible and that the micro-actor has much more than what they are led to believe.

3.1. *The growth of the actor*

The critical potential of ANT lies in the way it focuses on the way power is accumulated, concentrated and maintained in a network, how the power of others are tapped on and enrolled in a powerful programme of action, how identities are formed and interests shaped. The central critical focus of ANT is the way the network is constituted. ANT investigates the strategies of power and the ways in which relations of power obtain durability in networks. Related to the operation of power is the way distributions take place in the network (Law, 1991b; Law, 2002; Vikkelsø, 2005). With reference to Hobbes' image of the total ruler, Callon & Latour (1981) ask how this Leviathan comes into being and maintains itself. How are the interests of some shifted in order to promote those of others? How does some succeed in expanding their power through the compliance of others? How does it happen that the regime of power seems so impenetrable and the possibility of resistance so meek? How do the black boxes which store and hide the power become sealed?

ANT's radical critical potential is present in the methodological assumption that macro- and micro-actors are isomorphic (Chapter 4 Subsection 2.3) and that any difference between them is the result of processes of translation and enrolment. The investigation of these processes provides a critical perspective on the growth and stability of the macro-actor.

ANT provides the means to recognise the nature and degree of the differences:

...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 realize themselves, and to note that it could and often should be otherwise. (Law, 1992:390)

Because of the isomorphism a shift in register is not needed to study the macro-actor. Exactly the same tools and strategies could be used to study both the micro- and the macro-agent. Such a shift in register is, for example, present in Kallinikos' (2004) account of technology where the power of technology is related to its inherent nature as self-referential and systemic. This approach of Kallinikos disempowers those that could act as the agents of transformation.

The methodological principle of isomorphism counters the belief in the self-sufficiency and autonomy of the macro-actor. Once this actor has obtained its position, the history of the process of collection is forgotten. Retracing the translation processes does the reverse, it

recalls all the work and the consent that was granted, that was needed in order to achieve the seemingly natural order, where each element relates with the others. (Callon 1986a:28)

Retracing the translations relocate us to an imaginary place:

Let us then imagine a body where differentiation is never fully irreversible, where each cell attempts to compel the others to become irreversibly specialized, and where many organs are permanently claiming to be the head of the programme. If we imagine such a *monster* we shall have a fairly clear idea of the Leviathan's body. (Callon & Latour, 1981:285)

The 'monster' here refers to the complex, powerful, heterogeneous network which became irreversible through the successful enrolment and mobilisation of multiple entities, where everyone is locked in the place allocated to it, where identities became fixed and where complexity and diversity are diminished. This is only possible if the many problematical ways in which enrolments and translations took

place are not recognised. The ANT sociologist studies all associations, but in particular the transformation of weak interactions into strong ones and vice versa (Callon & Latour, 1981:300). In the process ANT does not only focus on the powerful, but on the 'distributions' (Law 1991a:15) which refer to the different fates of the heroes and the victims, on the ways in which quantitative differences translate into qualitative ones.

The tracing of translations is important because of the many and subtle shifts that take place in the process. The theory of irreducibility implies that translations always are, to a lesser or larger extent a betrayal (Law, 1997; Latour, 1996a:48) because it entails the reduction of one entity to another. Since it is not possible for critique to establish the exact extent of the betrayal, critique focuses on whether and how translations are being resisted, or whether entities go along with their enrolment within someone else's network.

The aim of critique is then to make visible the processes and strategies through which a totality is constructed and maintained. It shows how power is translated through delicate processes, how various entities are enrolled within the network. It shows eventually that the powerful has feet of clay and that the centre actually doesn't hold (Law, 2002). It shows how the clay-ness of the feet is hidden and presented as impenetrable and seamless. Without critique the system appears to be total, the powerful sovereign, the technology closed and efficient, and the decision final.

With reference to the theory of power explained in Chapter 4 (Subsection 4.3), critique unravels the effort and cost to make power effective and to maintain the network. The extent to which a network is dependent on continual maintenance is indicative of its fragility. This reconceptualisation of power contains the potential to counter the reified notion of power as a possession which is permanently located in a person, thing or place. This realisation liberates critique from the Weberian (1947) notion of the iron cage which precludes the possibility of critique and transformation. Many spaces exist in the network to negotiate and resist. This Weberian notion of objects is what we should be emancipated from:

I'd like to believe that, on the contrary, I intended to *emancipate* the public from prematurely naturalized objectified facts. Was I foolishly mistaken? Have things changed so fast? (Latour, 2004c:227)

The possibility to construct a different network is enabled by the identification of openings in the networks. These openings are the result of the circulating nature of social processes (Chapter 4, Subsection 2.3). These processes do not consist of a relation between relatively fixed poles of structure and agent, macro and micro. The circulation implies that the network is not a stable or unified entity and that many empty spaces exist.

This empty space 'in between' the networks, those *terra incognita* are the most exciting aspect of ANT because they show the extent of our ignorance and the immense reserve that is open for change. (Latour, 1999a:19)

The "empty spaces" indicate that the macro-actor is not as homogeneous and powerful as it seems and it indicates the possibilities of critique.

3.2. The marginalised

A necessary effect of the growth of the macro-actor is the many ways in which entities are marginalised and excluded. The evaluation of the composition of the network by means of the principles of due process (see Section 7.2 below) helps us to understand that exclusion is necessary and legitimate. It is necessary for the stability of the network that some entities are excluded according to a set of rules about the admission of entities into the network. Not every entity that knocks on the door could be allowed in. The purpose of due process is to establish who should be in and who should remain outside. Those excluded do not necessarily remain outside since they could knock again at the door for readmission.

Although exclusion is a necessary part of assembling, it is also problematical. While the network of the door closer aimed to exclude the strong wind, it also excluded the old and frail that cannot push against the firm hold of the groom (Latour, 1988b:301; 1994:234). Some of these exclusions may be undesirable and may require a change in the network. In an attempt to extend the critical scope of ANT, Star (1991) shows how McDonalds discriminates against those allergic to onions and how some identities are not recognised in a network. The allergic ones are not consulted in the

establishment of the network. She emphasises that any (critical) account of a network should always ask the question: who benefits from a particular organisation of distributions. The value of this perspective is to see that discrimination and exclusion are based on the way the network is constituted and not merely an unfortunate inconsistency in an otherwise moral entity.

The question should be asked, as posed *i.a.* by Feenberg (1999), how we become aware of those that are excluded if they are not in a position to raise their voice within the network. The problem with ANT's focus on the local, according to Feenberg, is that it is unaware of actors that are absent such as the gendered and racial others. Since those that are excluded are also deprived of reality, how could we even notice or hear them? It is essential for Feenberg that critical theories be employed to alert us to the excluded. ANT's response to this issue will be pursued further in Subsection 5.2 below.

Exclusion is not necessarily permanent since those who are excluded may become at a later stage part of a new network. Networks are also dynamic entities which may enrol a previously excluded entity.

4. Purposes

Whereas critique focuses on the growth of the macro-actor and on the identification of the excluded in the process of establishing how distributions take place, the purpose of critique is to increase the morality of the network. The question, who benefits (Star, 1991), is central to the way a network consists of a particular set of distributions. This critique cannot be done through the imposition of a metanarrative of morality, but procedurally by means of due process. ANT could be presented as a moral theory because of its central concern with the state of the network in relation to issues of identity, exclusion and participation. ANT is not directly concerned about issues of emancipation¹¹ or justice since these projects requires substantial theories.

¹¹ While ANT avoids the concept "emancipation", it is motivated by a deep concern about the way in which and extent to which entities are betrayed (Callon, 1986b; Law, 1997), or reduced (Latour, 1988a) or how democracy is frustrated (Latour, 2004b). Such a concern could be shown in many ANT studies of which Law (2002) or Latour (1996a) are two examples.

In relation to Stahl's (2008) notion of "good life" it could be said that ANT bases its notion of good life on the principle of the inclusion and the irreducibility of every entity. Inclusiveness does not mean that any possible entity should be given an equal voice in the network. Due process provides an orderly way in which entities are allowed in and others legitimately excluded.

Critique does not aim to destroy, but to build, to describe and care for what holds the network together while looking critically at how it is done and how distributions occur.

Critique aims to make a difference (Latour, 2004a:73) and to transform the network. This is based on the assumption that any network could have been otherwise (Law, 1992:390; Star 1991:38). The analysis of the macro-actors above has shown that they are fragile although they may look impenetrable and "natural". It is the task of critical ANT to show in detail how contingent a network is and how leaky the black boxes are out of which it is made up.

Transformation is not the big modern project which changes the whole in a linear way on the basis of a principle of justice or equality. Transformation is also not the postmodern process where multiple resistances defragment the whole. A transformed network is often as oppressive as the one it replaced. There are no guarantees that a new assembly will be freer, more authentic, or more just because we cannot know how our mediators will translate our interests. Critique should refrain from participating in a substantial way in the process of transformation as discussed by Alvesson & Deetz (2000) because that would kill the critical spirit. Transformation refers to the building of a new network through the same problematical processes of

The concept "emancipation" is not used because of the problematical connotations attached to substantive notions of emancipation. Such substantive notions are present whether emancipation is cast in term of notions of negative or positive freedom (Berlin, 1969; Gould, 1988; Taylor, 1979). In notions of negative freedom it represents an attempt to specify exactly what we need to be emancipated from (internally such as desires and drives, or externally such as the capitalist system or managerialism), and in terms of positive freedom it attempts to specify what we should become (such as a rational, autonomous, communicative being).

To avoid the grand narratives of modernity, critical theorists have qualified the notion of emancipation in terms of an "emancipatory intent" (Brooke, 2002d; Stahl, 2008: 139). It could be argued that this is not very different from ANT's concern as portrayed in this study (see critical comment on ANT in Chapter 8, Section 11).

translation and mediation that are the focus of critique. If any particular substantive notion of a transformed state were to be the purpose of critique, such a transformed state could easily be thought to be exempted from critique.

Instead of understanding critique in terms of transformation, it should rather be seen as a small scale and limited test of each translation and enrolment, and the opening up of alternative associations. Critique should not bring about transformation in a direct way, but should create some conditions within which change may happen.

5. Strategies

5.1. *The researcher*

In comparison with traditional critical approaches, ANT allocates a weak role to the critical researcher. The critical researcher does not have access to knowledge and insights those inside the network do not have. The researcher may be motivated by a moral concern (Walsham, 2005), but can't translate that directly into a better form of knowledge. The strong role which is traditionally allocated to the critical researcher is problematic in two ways. It is problematic because a position of privilege on epistemological or moral grounds cannot be allocated to the researcher. It is also problematic because of the implicatedness of the researcher who participates in the performance of the object of research. These two problems have to be overcome if a strategy of critique has to be defined.

The privileged position of the researcher is a problem if one wants to avoid any form of ethnocentricity (see Chapter 4, Section 2.1). This raises the question about the possibility of critical research that is endemic to interpretive approaches. How is critique possible if there are no transcendental theories and if the researcher is not allowed to use an 'ethnic' bias as an orientating device? How is critique then possible if the researcher does not know in some way better than the objects of research?

ANT displays a keen awareness of the implicatedness of the researcher in the constitution of the object of research. The creation and use of categories such as 'gender' or 'race' also perform the realities which they want to uncover. The

description of technology as deterministic or alienating contributes to exactly these performances of technology as deterministic and alienating. Information is not a neutral entity because it contributes to the constitution of the object. For Callon & Latour (1981:301), “[a]ll information is transformation”. All interpretations of a network “act upon it, *performing* and *transforming* forces according to whether they are machines, codes, bodies or markets...” (Callon & Latour, 1981:297). Critique has therefore to be reflexively aware of the consequences of its own performances of reality.

Because of these two problems, the researcher cannot bring enlightenment to those in the field of study. The ANT researcher still has the intention to change the network, but has to assume a very different role. The researcher can therefore not claim an objective position which is separate and apart from the object that is being analysed.

5.2. Absence of theory

In critical traditions the uncovering of the influence of ideological and material factors in a particular context is an important source of critique. The assistance, for example, of theories of managerialism or of capitalist contradictions, is needed to enable a critical perspective. The use of such theories is for Orlikowski & Baroudi (1991:23) an essential element of critique because it provides a deeper reality which transcends the limited boundaries of the particular context. It is accepted that a theoretical leverage is needed to open up the underlying mechanisms of power in a particular context.

Because of its awareness of the implicatedness of the critical researcher in the performance of the research object, the theses of symmetry implies that macro-theories could not to be used in the explanation of actor's actions and beliefs (see Chapter 4, Section 2.1). This principle applies also to the use of critical theories since the process of critique is in essence not different from the tracing of the assembly. Critique is therefore dependent on an adequate account of the processes of translation and mediation in a particular network. If a critical theory from outside is needed, then the ways in which particular interests are translated, is not yet adequately done.

Critique could only be based on a proper analysis of relations in a particular context. In his comment on the future of Science and Technology Studies (STS), Law (1999:15) states that STS

[i]s at its best when it handles its overlaps by building local knowledge in a way which involves neither seeking a grand narrative, nor embracing what is sometimes called the 'despair' of moral relativism.

The 'despair' of moral relativism refers to a kind of empiricism where the views and beliefs of the research objects are left intact. In his attempt to address the moral issue, Walsham (1997:475) finds the way ANT approaches morality, problematic. With reference to the exclusion of the African continent from the network of the Internet he argues:

Where do moral judgements come from if not from ideas that transcend the situation? If the internet is examined, we do not need actor-network theory to tell us that the African continent is almost totally excluded. We cannot make a moral judgement on this on the basis of the network alone, but need political and ethical theories concerning socio-economic development. (Walsham, 1997:475)

According to this view critique needs to identify an ideology at the macro-level in order to identify a particular and local case of discrimination. The symptom at the micro-level could only be recognised in the light of a macro-theory which escapes the confines of the local situation. The macro-theories of race, class and gender enable the identification and evaluation of forms of domination and distortion at the micro-level.

Doolin & Lowe (2002:74) respond to this accusation by saying that they

do not accept that the agnosticism and ontological relativism of actor-network theory precludes critique. Instead, the paper will argue that the very act of tracing the network and the actions of its constituents, combined with a refusal to *a priori* make distinctions or grant status, enables a critical light to be shone on the assumed, the mundane and the status quo.

ANT sees the role of critical theories in the same way as any other theory that is being used to explain a particular context. If the actions of people in a certain context are seen as an instance of a general theory, then they are deprived of their own agency since they do not act any more by themselves, but merely instantiate a

general theory. If a particular context is an instance of the theory, its irreducibility (Latour, 1988a) gets lost when it is reduced to the larger network.

Latour (2004a) argues that an ever more complete description makes the introduction of external theories unnecessary. The more careful the tracing of enrolments and translations, the more opportunities for critique become visible. Such a careful tracing reveals who is enrolled into whose network, how and in what ways interests are translated, how identities are created and maintained in the network. Such a tracing of the network reveals that the network is never as tightly woven as what appears from the outside. It reveals the multiple small ways in which relations are forged. It reveals that the opportunities to resist exist in many places.

If we display a socio-technical network—defining trajectories by actants' association and substitution, defining actants by all the trajectories in which they enter, by following translations and, finally, by varying the observer's point of view— we have no need to look for any additional causes. The explanation emerges once the description is saturated. (Latour, 1991:129)

The problem ANT finds with critical studies in IS, is that this tracing of the assembly is not yet adequately done. A typical case of this is how Smith (1988, in Orlikowski & Baroudi, 1991) provides a critical account of EPOS (electronic point of sale) technology. Smith sees this technology as malleable since it is used differently in different organisations. He argues that it is used in organisations dominated by a managerialist ideology to strengthen the bureaucratic control of managers. This is for Orlikowski & Baroudi (1991:23) an example of how technology is used to enhance the contradiction within capitalism between managers and workers. From an ANT perspective, the problem with this kind of critique is that the particular network is not yet adequately analysed. The careful analysis of the network is replaced with the invoking of a meta-narrative of capitalist contradiction to explain why EPOS is being used in this particular way. What is more important for ANT is to carefully trace all the actants in this network in order to show how EPOS came to fulfil this role. The focus should be on the processes of translation and mediation within which the technology is centrally involved. If theories were to play a role in the local production of effects, it could only do so via the beliefs and actions of the actants involved.

While ANT refuses the employment of transcendental theories or morality, it cannot be said to limit itself to what is immanent to the network. Networks are dynamic

entities where the boundary between inside and outside is continually redrawn. A general theory that impacts on the actions of actors becomes part of the network as an actant. Callon (1999) shows how a theory about the *homo economicus* developed in economic science plays an active role in the constitution of economic networks. Similarly, a theory of alienation which effects the actions and beliefs of entities in the network, becomes an actant in the network. A theory that remains transcendent does not have any effect on the network and cannot be used to explain the underlying mechanisms of action. It has an effect only when it becomes immanent to the network, but then the boundary of what the network is has already been redrawn. The ability of ANT to move from the micro- to the macro terrains and to shift the size of the network, makes it possible to incorporate any entity defined by theoretical perspectives such as class or gender or race. The point is that these entities cannot be brought in by the researcher if they are not already present in the beliefs and frameworks of the insiders.

The researcher becomes an actant in the network if the text produced has an effect on the translations and associations in the network. Although one network could be related to any other, and overlapping networks exist, the question still needs to be answered how a particular actor (an ideology such as managerialism) enters a particular network. It can only do so by becoming an actant in the network through the processes of translation. If broader contexts are important, then those contexts should be seen as part of the network that must be analysed. A network cannot be explained with reference to a broader “context”. Context is not something out there, but they “too flow locally through networks” (Latour, 1999a:18).

The absence of evaluative theories does not render the ANT descriptive approach neutral because it is deeply suspicious of every mediation and translation. It aims to test the “trial of strength” (Latour, 1988a:158) of each transaction:

Each of these elements (translation, simplification) will only be revealed if they are brought into a controversy: in other words, into a trial of strength in which the entity is suspected. (Callon 1986a:30)

Critique does not come from meta-narratives, but from a reversal of the processes of mediation and translation. Each translation must be traced in order to establish who/what is being translated and enrolled into who/what. Nothing can be taken for

granted, no association is automatic and everything is problematised. The basic 'irreduction' of every entity implies that no two entities could automatically be associated without a translation of interests. There is always a price to pay in any association and the stronger the associations, the higher the price.

The necessity to describe the network as a pre-condition for critique, is highlighted by Latour (1991:130) as follows:

Finally, we are left with the accusation of immorality, apoliticism, or moral relativism. Refusing to explain the closure of a controversy by its consequences does not mean that we are indifferent to the possibility of judgement, but only that we refuse to accept judgements that transcend the situation ... Domination is an effect not a cause. In order to make a diagnosis or a decision about the absurdity, the danger, the amorality, or the unrealism of an innovation, one must first describe the network.

At the roots of ANT's critique is a moral issue as reflected in the two basic questions *how many are we?*, and *how do we live together?* (See Subsection 7.2 below). Both questions deal with the issue of inclusivity and do not require a reference point outside the network (Latour, 1991:130, see also Doolin, 2004). Any moral principle from outside the network would be seen as an imposition without such due process.

5.3. The Empirical

With the absence of framing evaluative theories, the researcher is only left with the processes of assembly in the network. Critique is a constructive activity which asks after the processes followed in the constitution of the network. It follows from a careful study of the network which slowly reveals alternative voices, whether propositions are clearly articulated, or whether the spokespersons are true representatives of those on whose behalf they speak, or whether each entity received its proper place in the hierarchy.

Latour (2004c: 231,232) wants to base his critique on a kind of empiricism dealing with 'states of affairs'.

The question was never to get *away* from facts but *closer* to them, not fighting empiricism but, on the contrary, renewing empiricism.

What I am going to argue is that the critical mind, if it is to renew itself and be relevant again, is to be found in the cultivation of a *stubbornly realist attitude*—to speak like William James—but a realism dealing with what I will call *matters of concern*, not *matters of fact*.

Matters of fact are only very partial and, I would argue, very polemical, very political renderings of matters of concern and only a subset of what could also be called *states of affairs*. It is this second empiricism, this return to the realist attitude, that I'd like to offer as the next task for the critically minded.

To investigate something as a matter of concern is to trace how it becomes part of the network, to establish what is required to maintain its membership, or what the implications are if it were to lose membership. To convert a *matter of concern* into a *matter of fact* is to treat it as an autonomous entity, separated from any process through which it became and maintained its membership. These autonomous entities are seen as justifying their own existence beyond dispute. *Matters of fact* are only a partial description of entities because the whole network that maintains their existence is forgotten. Their empirical tracing reveals how polemical they are when the network that maintains them is tested.

To treat technology as a matter of concern is to show what is needed to maintain it even though it often presents itself as a matter of fact, a black box. Critique which treats *matters of fact* as *matters of concern* prevents the premature closure of the process of constituting the network. It is therefore important that the black boxes, the matters of fact, are opened in order to establish how many entities are enrolled and how meanings, functions and purposes have shifted.

Latour illustrates this with the following comment when comparing the disintegration of the shuttle, Columbia, with the war in Iraq. Both of these are assemblies consisting of multiple entities. Latour found it a

[f]rightening omen, to launch such a complicated war, just when such a beautifully mastered object as the shuttle disintegrated into thousands of pieces of debris raining down from the sky—but the omen was not heeded; gods nowadays are invoked for convenience only. (Latour, 2004c:236)

The irony lies in the contrast between the confidence in the war and the disintegration of confidence in the technical object. While the technical object, which was assembled with so much care, did not prove to be reliable, a much looser network with much more devastating consequences was woven in war. If the lesson

of the fragility of the technical object were learnt, much more care would have been taken in creating the reality of war. The opening up of a *matter of fact* into a *matter of concern* allows the empirical tracing of the network and the critical questioning of how it is done.

A rereading of the ethnographic studies in ANT could be done with this critical questioning in mind. It is also now understandable how the close empirical study of assemblies could form the basis of critique. It could be shown that the empirical ANT studies are at the deepest level informed by critical questions about the inappropriate shortcuts and the excluded.

While it could be said that in ANT, “to reveal is to critique” (Doolin & Lowe, 2002), the particular way in which this revealing takes place, has to be acknowledged. It has been shown that the close empirical study of the assembly reveals in what way and to what extent due processes (as discussed below) were not followed. This could only be seen when the seemingly tightly woven network is opened up by identifying the processes of association and translation. It is not the same kind of revealing of Critical Theory which claims to uncover false consciousness, hidden assumptions and distorted interests, or the kind of revealing inherent in the hermeneutics of suspicion.

5.4. Assembly

The empirical tracing of the network, follows the rhizome wherever it goes. It records every association and translation, every new entity that is simplified and enrolled. After carefully considering the idea that the rhizome metaphor might suggest fragmentation, Latour still finds it valuable as a critical tool because it enables the tracing of the relations between the associations.

Talk of rhizomes allows the analyst to avoid revolution talks, technological fix talks, hypes of many sorts and is good at showing, for each innovation, the ordinary bricolage which makes it up. It also allows us to connect fragments together in the freest way. However, this is precisely where the weakness of rhizomes lies: they are critical of every move, including of course the denunciatory tone of the critique, but they remain critical tools, good only at distributing, undoing, deploying, disseminating ... (Latour, 1996c:304)

Critique needs to be more than just the faithful following of every new association and translation. It also has to find what remains constant. Latour envisages a very different kind of critique than what is developed in modernism.

Whatever the words, what is presented here is an entirely different attitude than the critical one, not a flight into the conditions of possibility of a given matter of fact, not the addition of something more human than the inhumane matters of fact would have missed, but, rather, a multifarious inquiry launched with the tools of anthropology, philosophy, metaphysics, history, sociology to detect how many participants are gathered in a thing to make it exist and to maintain its existence. (Latour, 2004c:245/6)

Establishing *how many* is important because the interests of some entities are translated to such an extent that they become invisible. It is not just a process of establishing *how many* but also what positions are being allocated to them.

The task of the critic is described as follows:

The critic is not the one who debunks, but the one who assembles. The critic is not the one who lifts the rugs from under the feet of the naïve believers, but the one who offers the participants arenas in which to gather. The critic is not the one who alternates haphazardly between antifetishism and positivism like the drunk iconoclast drawn by Goya, but the one for whom, if something is constructed, then it means it is fragile and thus in great need of care and caution. (Latour, 2004c:246) .

What would critique do if it could be associated with more, not with less, with multiplication, not subtraction? Critical theory died away long ago; can we become critical again, in the sense here offered by Turing? That is, generating more ideas than we have received, inheriting from a prestigious critical tradition but not letting it die away, or “dropping into quiescence” like a piano no longer struck. This would require that all entities, including computers, cease to be objects defined simply by their inputs and outputs and become again things, mediating, assembling, gathering many more folds than the “united four.” If this were possible then we could let the critics come ever closer to the matters of concern we cherish, and then at last we could tell them: “Yes, please, touch them, explain them, deploy them.” Then we would have gone for good beyond iconoclasm. (Latour, 2004c:248)

The “flight into the conditions of possibility of a given matter of fact” refers to a rationalised process through which restricting conditions are postulated for the legitimacy of propositions. The postulation of these conditions is done by the expert or the epistemologist who does so quickly, bypassing the lengthy due process. Proper consultation with all potential participants did not take place.

In contrast to this, the critic is mainly concerned about the network and whether it is properly constituted.

Every concept, every institution, every practice that interferes with the continuous deployment of collectives and their experimentation with hybrids will be deemed dangerous, harmful, and – we may as well say it – immoral. The work of mediation becomes the very centre of the double power, natural and social. (Latour, 1993:139)

This could be illustrated with reference to Latour's (1996a) investigation into *Aramis* which failed to become real because those involved did not love technology enough to take care of it¹². The assembly process refers to the contribution of critique to the constitution of reality. Critique adds to reality by identifying marginalised actants and silent voices that could be full members of a network. The empirical nature of critique contributes to the relational materiality by bringing new entities for consideration into the real.

5.5. The pin board

Section 5 started with the problematical task of critique which cannot draw on meta-narratives and which is implicated in the very process of critique (Subsection 5.1). The absence of meta-theories was explored further in the following three subsections (Subsections 5.2 – 5.4). Instead of the imposition of meta-theories, the critical potential of ANT's empirical approach was investigated. The discussion of the assembly (Subsection 5.4) indicates that more entities have to be brought together in order to display the complexity of any network. The underlying assumption is that critique is dependent on an awareness of this complexity which cannot be reduced to a single principle.

This section draws on the previous ones to show how these different elements could become part of particular strategies of critique. If the critical researcher is not able to articulate critique from a single position, how is critique then possible? How could critique be rendered with confidence if the foundation is taken away? If the focus of critique is the translation of interests and the reduction of one entity to the other, how

¹² This will be discussed in Chapter 7, Section 3.

could this be established if the researcher does not have a privileged perspective into the deep structure or the causes of false consciousness?

The task of the critical researcher is in essence not different from any other ANT researcher who follows the actors to establish how associations are formed and interests translated. Since no perspective including that of the critical researcher could be privileged, all perspectives within the network have to be presented. This requires that the propositions of all the actants in the network should be articulated and heard. This articulation relates in particular to those voices that are silenced such as the marginalised, and those that are silent such as technology. Since the voice of the researcher should not dominate the critical project, these voices must be made available to all. In this approach ANT is close to the postmodern multiplication of subaltern voices, but with two differences. In ANT it is not only humans who have a voice, but also the nonhumans; ANT also wants to rescue the coherence of the object (Law, 2002:193ff.) in opposition to the postmodern fragmentation.

Such an approach to critique is followed in *Aircraft Stories* where Law (2002) investigates a technical object, the TSR2 military aircraft. The text of Law consists of multiple perspectives on the aircraft which demonstrates its fractal nature: it is more than one, but less than many (Law, 1999:12). It is neither a singular object, nor fragmented and multiple objects. Law presents his text about the object in the form of a pin board on which the different narratives are juxtaposed. In this way it is possible to provide a descriptive account of an object which makes critique possible. A pin board consists of many different and seemingly unrelated items or accounts. Each account pins something else to the board without attempting to relate it to any other account. Each of the accounts is partial in the sense that it represents a narrative from the point of view of a subject position. The object cannot be fully known before all the accounts of all the subject positions are taken together. Each of the many different and opposing narratives (of which many more could be given) presents the object from an own angle articulating the voices of various actants. Where the postmodern approach of multiple narratives breaks the object up in unrelated fragments, the juxtaposition of different narratives on the pin board suggests relatedness.

The pin board does not dictate any particular reading, but allows the reader to see the “empty spaces” in the object itself and in the way it was assembled. The killer machine of a TSR2 is deconstructed into multiple perspectives but not in such a way that it totally disintegrates. Such a disintegration would have denied its devastating potential to carry nuclear bombs. The narratives also show some of the many ways in which the object failed to realise because of the resistance of various entities who refused to become enrolled. Critique focuses on the contingent way in which these networks are assembled. The purpose of critique is not to break up the networks, but to render the translations problematic. Since translation consists inevitably of the silencing of those whose interests are involved, critique is dependent on the articulation of the voices of the silenced.

The pin board does not attempt to provide a coherent narrative in which the inner conflicts and compromises of the object are resolved, but leaves them open for the reader to explore. Once the accounts are pinned to the board, one could stand back to find possible ways in which the narratives relate, differ or cohere. The juxtaposition of multiple narratives demonstrates the fractal nature of the object and the multiple opportunities for different associations. In this way the fragility of a network and the possibilities for different associations are made visible. The multiple narratives do not only provide different accounts of the network, but they also perform different networks through which a new configuration may arise.

The strategy of a pin board acknowledges that the “status quo” is not in the same way oppressive to all marginalised groups. The imposition of a single theoretical critical category (such as class, race, and gender) privileges the oppression of some above that of others. The construction of any particular group or the classification into any category already implies forms of exclusion (Bowker & Star, 1999) and contains the virus of essentialism. Critique informed by the pin board produces multiple narratives in parallel to the multifaceted operation of power which produces many forms of exclusion and oppression. It is not a single narrative against a unitary, well defined and common enemy, but a battle at multiple and shifting fronts. The pin board counters the exclusion of voices of which the modern critical project is guilty.

This approach of juxtaposition is illustrated by Mulcahy (2008) in the context of teacher standards in Australia. The national process aimed at quality and

accountability, develops into the setting of detailed and explicit standards for different learning areas in schools. The setting and control of standards is a political process in which the national initiative became a dominant actant. Mulcahy does not argue for the abandonment of this project, but for the juxtaposition of alternative ways of understanding standards. This is necessary because these standards could become black boxed which may lead to unanticipated and undesirable effects. Such a radical alternative approach is based on the embodied standards that are enacted in concrete and complex classroom settings. This approach to standards gives voice to the teacher, to novices and to students. It is based on the understanding that “standards *in situ* are not categories, or capabilities, or sets of descriptors. Rather, they are embodied actions”. This process of juxtaposition is critical because it challenges the dominance of the national process and creates space for the recognition of the complex practice of teachers. The juxtaposition is based on a notion of ‘ontological multiplicity’, demands recognition for radical difference and creates a tensional space “from which learning that sustains teaching can emerge”.

Mulcahy also demonstrates the political involvement and responsibility of the researcher who questions the politics of standard setting with a belief that “no version of professional standards ... needs to and ought to prevail”. The researcher is motivated by the critical notion that “radically different ways of ‘doing’ accomplished teacher and standards of accomplished teaching are possible and to be preferred”.

Articulating fundamentally different accounts (of standards) and articulating them together – maintaining the tension between the multiple and the seeming singular – provides a good guiding rule for how to go on in research. (Mulcahy, 2008:16)

The strategy of the pin board also acknowledges that entities belong to different networks with different loyalties which have to be made visible. Singleton & Michael (1993:258) describe how general practitioners (GPs) are problematically enrolled in the governmental network of a cervical screening programme, which is not in harmony with the networks they form with patients whom they feel they betray at times. The position in one network could be used to problematise the enrolment in another. The attempt by the governmental network to simplify the identity of the GP is resisted by them in the way the GPs “complexifies” and “problematizes” themselves. In the process they resist the translation of their interests within a single

network by referring to the complexity of their interests in relation to other networks. This account provides a picture of complexity and ambiguity of networks which cannot be simplified. It also shows how networks hold in spite of these ambivalences (Law & Mol, 2002). A better perspective on the contradictory and conflictual effects of these clashing interests could be well presented by a pin board.

6. Effects of critique

One of the problems of modern critique is the failure to acknowledge how the researcher is already implicated in the research project (see Subsection 5.1). The researcher is implicated when the critical categories and theories used to analyse and evaluate the object of research also contribute to the performance of the social world that is being researched. The critical researcher has to be reflexively aware of how s/he already transforms the object of research.

While commenting on Law's (2002) account of an aircraft in which the critical potential of the pin board is explored, Saldanha (2003:424) asks "what difference does Law want to make to military power?" He follows:

Rather gleefully, ANT in general leaves it up to the reader to criticise society. From its side, ANT just provides pinboards, which make a difference, of course (they are published and reviewed), but ultimately offer no justification for battling the status quo.

Although it seems to Saldanha that Law fails to provide any critique that would influence military power, once it is realised that the military object, as any other object, is not a singular entity, the battle against it cannot be conducted from a singular position. Because the status quo consists of multiple overlapping and conflictual networks, transformation depends on the testing of the resistance of the different elements that constitute our actor network (Callon, 1987:96).

The difference that critique could make emerges from the way the critical researcher contributes to the performance of reality. As is the case with the emergence of microbes from the hard labour of Pasteur (Chapter 4, Subsection 3.5), the labour of the critical researcher which aims to reveal the operation of power, already performs a different network. Something "objective" appears from the hard "subjective" labour of the researcher. In this way (critical) research is not simply based on the

subjectivity of the researcher (as Avgerou, 2005¹³), neither is it a mere reflection of the objective reality of oppression or of social contradictions. The performative nature of research contributes to the constitution of (a new) reality. ANT provides a way to understand the involvement of the researcher in the research process. The researcher is part of the constitution of the network and cannot be said to stand outside it. The role of the researcher to articulate (or allow to articulate) narratives from within the network, has already an effect on the network. The possible transformative effect of the involvement of the critical researcher on the network comes, paradoxically, not from the agency of the researcher, but from the agencies of those inside the network. The possibility of transformation does not lie in the researcher equipped with of a critical theory, but in the ability of those inside the network to resist certain translations and to form new associations.

Transformation is not to be brought about by the researcher in a strong way. The researcher does not produce a single narrative of how the network is built, but s/he facilitates multiple narratives which articulate the voices that are not being heard. Research is therefore already an intervention because the research process and results become part of the network similar to the way Pasteur's research made microbes part of the network and transformed it in important ways.

The efforts of the critical researcher result in the production of a text which reflects the careful tracing of the network. This text does not prescribe to the readers how to transform their network. Its task is to open up the multitude of controversies that were already settled and that are still open for settlement in the constitution of the network. By producing a text the researcher participates in the constitution of the object that is being criticised. The text has to be of such a nature that the spaces to manoeuvre are opened up for those inside the network.

Law and Mol (2008:142) ask:

How might writing be done in a way that opens up a space of contestation rather than closing it down?

¹³ Avgerou argues rightly that critical research is not based on any particular methodology, but is the result of the researcher's "embodied, situated experience" which include his/her tacit knowledge, emotions, and moral and political convictions as guiding elements in critical research.

This is not simply a matter of adding words to silent practices. Articulation requires that practices are put into contrast with their others. If other, equally possible ways of ordering are presented along with those under study, this helps to open up a space of contestation.

Not any text will do. It must be the kind of text that portrays those whom it writes about in particular ways:

Either you have actors who realize potentialities and they are not actors at all, or you describe actors who are making virtualities actual ... and that requires very specific texts, and your connection with those who you study requires very specific protocols to work. I guess this is what you would call 'critical edge' and 'political relevance'. (Latour, 2004a:74)

The text should make it possible for those who are investigated to see themselves as able to actualise possibilities suggested in the text. It is not simply the task of the critical researcher to launch an own programme of action on the basis of a substantial notion of emancipation, but to enable those inside the network to see what compromises they are made to live with and how things could be different.

The important difference between an ANT and traditional approaches to critique lies in the non-interventionist and a-theoretical stance of the ANT researcher. The ANT researcher does not know what is wrong in the network since s/he does not have a theory to identify such wrongness. The ANT researcher believes in the ability of the 'insiders' to better understand their own implicatedness in the assembling of the network and in their ability to contribute towards a different assembling. Whereas traditional approaches to critique are dependent on a transcendental position from where a network could be judged and the ignorant insiders illuminated the critical potential of ANT lies in the way insiders better understand the processes of assembling in which they are involved.

From this account, it could be said that critique should not be an actor-network since any actor-network is to be problematised from a critical perspective. An actor-network has the features of being well-aligned, various entities are enrolled, power is accumulated in a singularity and interests are translated. Critique wants to establish and uncover in what ways and to what extent entities are betrayed and reduced. Critique is described in this study by means of the metaphor of a pinboard (Chapter 7, Subsection 5.5). If the pinboard is to be taken as an actor on its own, it should at least be recognised that it is an actor of a particular kind and that it differs in

important ways from well-aligned actor-networks. It is not a macro-actor whose interests are being served through the enrolment of multiple heterogeneous entities. It does not represent an attempt to translate the interests of others, but, on the contrary, it enables them to speak for themselves (however problematical this is). It does not present a grand narrative through which critique could be centred. Critique in this sense cannot have a predefined agency of transformation because that would only privilege particular central actants. Such a weakness is essential for critique to avoid becoming a macro-actant by imposing its own definitions and categories.

7. Democracy

Whereas the previous section dealt with aspects of critique, this section describes the normative process through which the processes of assembly should take place. Where critique focuses on what is wrong, the processes of democracy describe the due processes of association. It will, firstly, be indicated that democracy needs to be expanded to include the voice of technology. It will, secondly, be indicated what the due process of democracy entails.

7.1. *Expanding democracy*

Critique in ANT aims to restore and protect the democratic process through which the network is assembled. Democracy is centrally about the full participation of every entity in the constitution of the network. Democracy is distorted in modernism where the network is established by “a small number of agents in the name of all” (Latour, 1993:76). The limitation that is placed on participants and on the processes of participation is justified in the modern mind with reference to Plato's allegory of the cave. In the cave, people are relegated to ignorance and idle chatter divorced from knowledge, truth and reality. Those in the cave represent the social, or the political. According to this metaphor, reality and truth lie outside the cave and are only available to the select few who escape from this social interaction between people. This politics/truth dichotomy is transferred to the distinction between science, which operates according to reason and method, and politics which operates according to power and rhetoric. It is therefore not possible to obtain truth through politics or to acknowledge the role of science in the constitution of the social. In the same way as

what politics is deprived of the opportunity to establish the truth, science is deprived of the opportunity to contribute to the establishment of the social.

These views of politics and science are wrong because a sharp distinction cannot be made between political negotiation and the negotiations in the laboratory.

Democracy must be expanded to things exactly because the entities that appear in the laboratory have far-reaching effects on human society. In order to rectify this, democratic participation must be expanded for Latour.

If there are more of us who regain the capacity to do our own sorting of the elements that belong to our time, we will rediscover the freedom of movement that modernism denied us – a freedom that, in fact, we have never really lost. (Latour, 1993:76)

We have never lost the freedom because “we have never been modern” in the sense that the modern processes through which democratic participation were limited were not consistently applied. The “sorting of the elements” refers to what critique is about with the one condition that the participants in critique must be expanded. More of “us” refers to both humans and nonhumans who participate in the sorting out.

One problem in this is that the voice of the nonhuman entities could only be heard through the representation of a human spokesperson. Representation is always problematical since it part of the processes of enrolment and translation. In both cases the interests of the represented is changed. Although no entity could be defined in an essentialistic way, the question can always be asked to what extent their identities and interests are changed or reduced and at what stage translation constitutes betrayal? Because of the problematic nature of representation, the true voice of an entity cannot be established. The silent power nonhumans exercise in the shaping and maintenance of the network cannot be properly heard.

It is an important part of the expansion of democracy to recognise the ways in which things participate in assembling the network. A recognition that democracy is also a “parliament of things” (Latour, 1993:143) reveals how things such as technologies ought to participate in the processes of sorting. The realisation that things play such an important role in the maintenance of the network demands close attention to what they do and say.

7.2. *Due process*

Whereas the social processes (see Chapter 4, Subsection 4.2) provide an analytical account of how networks grow and how entities are enrolled, the theory of *due process* (Latour, 2004b) introduces an ethical element in answer to the question how this should happen. In *Politics of Nature*, Latour (2004b) provides a normative account of how any collective (network) should be put together democratically. This process provides answers to the basic questions of democracy: who should be allowed to be part of the network, and how should relations in the network be organised? It also attempts to answer these questions in such a way that no entity is inappropriately excluded or arbitrary included. The process has also to allow for the non-discursive ways in which some entities (nonhumans) participate. No entity could simply become part of the network without due process, and due process could also not be merely a 'tribunal of reason' (Latour, 1987:179-213).

Latour provides a political ecology which focuses on the relation between humans and nature and addresses the problems related to the distinction between fact (nature) and value (society). This account could also be related to the collective (network) that is formed when humans and nonhumans (technology) come together which relate to the fact/value distinction. The composition of the network should happen with the utmost care and should not be rushed. The respect for the procedures inevitably implies a "slowing down" of the whole process (Latour, 2004b:123).

Latour identifies two basic questions that are being answered in the process of establishing a network: *How many are we?*, and *Can we live together?* These two questions correspond with two powers operating in the collective: the power of *taking into account* and the power of *putting in order*. The power of *taking into account* is where decisions are taken about the number of entities that should be included in the network and consists of two requirements, *perplexity* and *consultation*. The power of *putting in order* consists of the requirements of *hierarchy* and *institution* (Latour, 2004b:115). Due process is meant to provide the moral principle for the critical evaluation of assembling the network. It is a principle through which ANT wishes to go beyond the choice between grand narratives and moral relativism (see Subsection 5.2 above).

Each of the requirements of due process provides a norm against which the morality of the democratic process could be measured. As such critique deals with the network as a whole and not with any particular aspect or element (such as technology). Critique also accompanies the network from its ever present beginnings. The transition from one stage of the constitution of the network to the other should not happen without consideration of the four requirements. The desire to quickly articulate the propositions of new entities should not cut the process short of identifying new entities. Since the stages are cyclical, those excluded through the process of institution, knocks again at the door to go through the whole process again. These requirements and the critical questions are explained in the following paragraphs.

The requirement of *perplexity* states that “you shall not simplify the number of propositions to be taken into account in the discussion” (Latour, 2004b:109). This is where new entities are defined which might cause an interruption of the collective. The procedure for constituting the collective is dynamic in the sense that new candidates are continuously identified. Science (Latour, 2004b:77) and technology are important sources of these new entities which apply for recognition. This is, for example, the case with the introduction into the collective of microbes by Pasteur. The central question in various research projects was to establish whether microbes (1988), or the *VEL* (Callon, 1986a), or *Aramis* (1996a), should be part of the “us” of the network. Concerns are being raised about the possible effect of these new entities on the network and on the identities of others. The introduction of entities whose role and place are not clear causes perplexity for a network which always aims to maintain its hierarchy and order. The requirement of *perplexity* is important since it prevents the network from becoming complacent about its current members. In the stage of perplexity, critique aims to sensitise about those entities which are ignored or forgotten. The question is asked whether the network reflects sensitivity to those previously excluded. Bloomfield & Vurdubakis (1999) make the point that the boundary must always be renegotiated and redrawn and that a clear distinction cannot be made between humans and the technological monsters. In a sense we remain in a permanent state of perplexity.

Once new entities are discovered or constructed, their place and status within the collective have to be established through *consultation*: “You shall make sure that the

number of voices that participate in the articulation of propositions is not arbitrarily short-circuited” (Latour, 2004b:109). Each entity is allowed to make propositions about themselves and their place in the network which then has to make a judgement about their status. This proposition consists of the claim to reality the entity makes, as well as its implications for the network as a whole. Since new entities are not only humans, but also machines, natural objects, etc, the propositions are not always in verbal form, but could also be stated materially. Whether human or not, representatives and spokespersons are needed to articulate the proposition.

It is expected that the articulation of propositions would make the significance of each entity explicit. Winner (1986) explains, for example, how many technological projects such as mass transit systems or water projects “mask social choices of profound significance”. Propositions are also often couched in terms of cost cutting and efficiency and their introduction is often seen as merely technical while their profound impact on the network is underplayed thereby hiding the possible implications for the network. In the consultative process it has to be established whether a new entity’s proposition should be accepted and whether inclusion in the network is possible.

The critical questions relevant to this requirement deal with the issues whether the propositions are adequately articulated and whether the spokespersons accurately represent the interest of the represented. Articulation is a problem if one takes into account that most of the actants in the network work in a silent and non-articulate way. The lack of articulation makes the analyst’s job so much harder (Latour, 1994:240). The problematic nature of representation is pertinent if one realises that in order to represent someone/-thing, one first has to silence those you represent (Callon, 1986b:216). It should therefore be taken for granted that interests are always misrepresented and mistranslated. The “silence” of machines is therefore a problem in the consultation process since they represent propositions that are not well articulated. These propositions are not merely what the designers programmed into a technological system. The effects of misrepresentation are sometimes visible such as when the scallops did not want to attach themselves in spite of what their spokespersons had to say on their behalf; or when the fishermen violated the agreement their spokespersons reached with the researchers (Callon, 1986b).

Once a decision is taken that the new entities should be part of the network, the question is what exactly their identity and place should be. How should the network be rearranged in order to maintain its internal consistency? *Hierarchisation* consists of the requirement: “You shall discuss the compatibility of new propositions with those which are already instituted, in such a way as to maintain them all in the same common world that will give them their legitimate place” (Latour, 2004b:109). In this process the relative value of an entity has to be established in relation to those already in the network. It could happen that a new entity became so important that the whole network is redefined, such as Pasteur’s microbes which changed the practices of health and farming. The establishment of a new hierarchy failed in the case of the *Aramis* project.

In the process of *hierarchisation*, critical questions have to be asked about the place an entity assumes in the network and the identity that is allocated to it. The central critical issue for Law (2002) is the way distributions of resources, power and identity take place in a network. Vikkelsø (2005:25) describes the issue of distribution as follows:

- The redistribution of work: Who will be relieved? Who must work harder?
- The redistribution of attention: What is brought into focus with what effect? What kind of blindness is made with what effect?
- The redistribution of risks: How are risks reduced/increased and for whom?

In the light of the idea that hierarchy refers to the relative importance attached to each entity, Latour (2004b:113) asks the critical question why the prions, the proteins responsible for mad cow disease, which might have killed a few people, are questioned so much, while cars which kill eight thousand people a year do not receive any special attention. A high value is attached to the freedom of the car which is allowed to speed and threaten the lives of many people. Why is the hierarchy arranged in this particular way and is the relative value attached to each entity justified? Although the establishment of a hierarchy is essential for the constitution of the network, the critical question is whether each entity receives its legitimate place according to due process.

The requirement of *Institutionalisation* states: “Once the propositions have been instituted, you shall no longer question their legitimate presence at the heart of the collective life” (Latour, 2004b). The process of institution is the allocation of reality to the entities which make up the network. In this way reality grows with the expansion of the collective. Since everything that is real is part of the network, reality is not something out there that should be discovered or that could be manipulated. Once the place of an entity has been established in the network, it should not be arbitrarily questioned. The stabilisation of the network is necessary to protect it against arbitrary changes and against the invasion by foreign entities.

Various critical questions need to be asked in relation to institutionalisation. It has to be acknowledged that institutionalisation as such is not a problem but an essential stage in the constitution of the network. While it is important for the network to exclude some, it is immoral when due process is not followed. In the stage of institution the question remains whether the assembling is not being closed prematurely. This happens when labels such as rational/irrational, human/nature, social/technical are attributed to entities before institutionalisation could happen. The result is that their possible inclusion and position in the network were decided before they could make a proposition. Due process is violated when essences are prematurely allocated or values defined or when nature is taken as an indisputable given. A critical question could be asked about the way boundaries are drawn between the inside and outside of a network.

These powers and requirements could be illustrated to evaluate the assembly of any network. In the case of the Pasteurisation of France, Latour (1988a) describes how a new collective “France” is constituted through the introduction of microbes. The microbes with their origin in the laboratory of Pasteur became part of the larger network with economists, politicians, farmers and veterinarians. The scientist as the spokesperson of the microbe articulated its proposition. Farmers, veterinarians and journalists became the judges of the proposal during Pasteur's public demonstrations. With the enrolment of humans and nonhumans the collective grew and thereby the reality of the microbes. The outcome was that the microbes became, in the form of a vaccine, part of the everyday practices of veterinarians and farmers. Its place in the hierarchy of the constitution was established and its effects on the collective produced. Reality is expanded and made more complex through the

incorporation of a new entity. The whole collective is reconstituted and new identities are created, such as that of the cow, the veterinarian, the farmer, the scientist, viral infection, etc. This process could be accompanied by various critical questions, such as the reliability of the spokespersons of the microbes or the farmers; the question whether institutionalisation did not happen too soon when the vaccine took its place in the new hierarchy of the society, etc.

Critique is addressed at the way an assembly is gathered and judges whether assemblies too quickly become indisputable matters of fact. The quick conversion of a matter of concern into a matter of fact takes place when due process is not followed such as when the question *who is excluded in the process of closure?* is not asked.

8. Conclusion

ANT does not present a particular method of critique such as the uncovering of false assumptions, or the diagnosis of false consciousness, or the identification of contradictions. Critique cannot come from any particular paradigmatic perspective because that would merely elevate such perspective above the perspectives of those under investigation. If critique is to be possible and effective, it has to originate from the articulation of the many voices present in a network, including the “voice” of nonhumans. The articulation of multiple voices is in line with the methodological principle to follow the actors and to record how they enrol others or are enrolled by others.

This chapter has shown how ANT steers a route between the strong form of critique presented by grand narratives of emancipation, and the weaker forms of critique presented through postmodern defragmentation and deconstruction. It shows how a form of critique is possible that avoids the centredness of the researcher as a possessor of a critical theory and the relativism of a position that merely records what is being said and done. ANT attempts to achieve this in no other way than through its methodological dictum to follow the actors and to report what they do.

Although the conceptual tools of ANT is limited and theories largely absent, its central interest in power and distributions makes critique possible. The tools that

ANT employs do not simply enable a neutral recording of actions, but traces how power becomes concentrated and what is distributed to whom. Whereas the network comes into being through processes of translation and mediation, becomes stable and irreversible through various processes, critique retraces these steps with a moral question in mind.

ANT does not have a strong process through which the transformatory agent is activated. The notions of critique and transformation are extremely weak because they do not translate into a transformative programme of action. The problematisation for which critique is responsible does not translate into the enrolment and mobilisation of entities. Critique is not an actor-network. One cannot talk about a critical movement or a school of critique. It should be obvious that critique is parasitical on the existence of networks and has no other justification than testing the morality of the network.

The power of this approach lies in the inseparability of the processes of the research and the critique of the network. Critique is not a different faculty that comes about after or separate from the tracing of the network but it is a constant presence in this process. The fact that the critical potential is not pursued in an explicit or intentional way in many ANT studies is not an indication that it is not present. A further implication is that critique is not necessarily related to a critical intention. On the one hand, a critical intention does not necessarily translate into an effective form of critique, and on the other hand some tracings of a network could “drift” into a form of critique, or could be read as critique.

Latour's (1986) preference for a translation model of power could be used to understand the nature of critique better. Latour contrasts the translation model with the diffusion model of power. Applied to critique, a diffusion model would mean that critique is effective when the power of critique extends itself further. Critique is effective when it is strong enough in itself. In opposition to this, a translation model of critique would mean that critique is dependent on other to carry it forth. Since critique is dependent on others, it has to be translated into a different form. The important issue is to be able to recognise the many forms into which the critique is translated and the question whether these different forms could be brought together in a pin board fashion.

The empowering effect of an ANT approach to critique lies in the way entities come to realise how they are given an identity, how they are enrolled in networks of power or how they contribute to the power of others. In the process ANT problematises the notion of human freedom as freedom from power, networks or technology. This analysis reveals how (human) entities participate ambiguously in the power of the network. On the one hand they are empowered because they share in the “summed up” resources of the network. On the other hand their enrolment in the network draws their power and translates their interests. This is not a dilemma that can be resolved by means of a notion of emancipation. The portrayal of critique in this chapter paves the way for an investigation of a critical approach to technology which is addressed in the next chapter.

Critique of technology

1. Introduction

The critique of technology does not stand separate from the processes and roles of critique in the network as such. The previous chapters have provided a general account of ANT, an exploration of an ANT perspective on technology and the way in which ANT conceptualises critique. If the conception of critique as portrayed in Chapter 6 is a faithful translation of ANT, then a programmatic prescription cannot be given of how to criticise technology. The purpose in this chapter is therefore not to provide a coherent and complete account of how to criticise technology. This chapter gives some examples of such critiques which are juxtaposed to present a mosaic of studies which are interpreted as critical.

Since the study wants to be specific about technology, it focuses on the particular role of technology in networks and assumes that the processes of technologising could be identified within hybrid networks. It has been argued in Chapter 5 that it is possible to discern such a role of technology even though the boundaries between the human and the technological could not be clearly drawn and shift continuously. This distinctive role of technology in the network (see Chapter 5) justifies a separate critical focus.

This chapter theorises about the way technology should become the object of critique. This is done in two ways: The first section draws the aspects of critique discussed in Chapter 6 together and applies them to technology. In Sections 3 – 8 different empirical studies of technology are analysed and interpreted in order to illustrate the ways in which critique appears in them. This approach could be compared with Walsham's (2001) utilisation of case studies to show how IT contributes to global and local changes. The value of the case studies is that they provide rich empirical material which lend a "social grounding" (p.7) to the research. But, since the empirical case studies provide such a bewildering variety of data, theoretical orientating devices are acquired from Giddens and Beck. The approach that is being followed in this chapter also uses various existing research case studies of IT actor-networks. In contrast to Walsham this approach does not rely on theoretical perspectives to generalise across the case studies because it would defeat one of ANT's central principles. The strategy is rather to juxtapose these studies in order to trace the ways in which critique of these networks could be generated in ANT.

The accounts do not merely summarise the critique of technology present (or absent) in these studies, but reinterpret them with conceptual and methodological tools of ANT. An attempt is made to show concretely how the effects of technology are identified and articulated. Although the studies do not necessarily present themselves as critical, an interpretation is provided in order to identify and articulate the critical elements. The interpretation of these studies presented here attempts to highlight the critical potential of these ANT accounts. This chapter does not attempt to generalise across the studies that are being discussed, but rather demonstrates a diversity of empirical studies with a critical intent. The attention shifts in Section 9 to the relation between critical research and other research paradigms in ISD. Questions are asked about the way in which critical research has been defined as a research paradigm on its own in opposition to positivist and interpretative paradigms.

2. Conceptualising critique of technology

This section provides, at a theoretical level, an account of the critique of technology. This is done on the basis of the discussion of ANT in the previous three chapters. It draws together what could be said about the critique of technology from an ANT perspective. This account serves then as a heuristic device when the empirical studies are investigated in more detail.

The critique of technology focuses on the active role technologies and technological devices play within the network. The question should be asked about the way they contribute to distributions in relation to agency, opportunity and resources to effect privileging, domination, marginalisation and exclusion. This includes an identification and description of the multiple technological devices that make up the network and a careful tracing of their roles and effects. These roles and effects could not only be seen in negative terms in the way they replace human roles, distort human values or constrain human freedom. The productive nature of this role should also be recognised in terms of the kind of life produced, the freedom defined and made available, the kind of values that are being reinforced and the human identities that are being created.

The critique focuses on the role played by technology as such and not on the way humans use flexible technological artefacts (constructivism), or on the way technology imposes a social organisation (substantivism). It focuses on the technological actant within the context of the heterogeneous networks. The focus of the critique is on what technology prescribes to other entities in a network. While these prescriptions could sometimes be related to inscriptions, they have to be seen in the context of how the network is assembled.

The issues that divide or unite people in society are settled not only in the institutions and practices of politics proper, but also, and less obviously, in tangible arrangements of steel and concrete, wires and semiconductors, nuts and bolts. (Winner, 1986:6)

The critical question is whether these prescriptions violate the interests of the enrolled entities. On the basis of the view developed in Chapter 5, technology is not simply seen as a tool to enhance the power of dominant agents but it is seen as a

mediator which effects changes in the identity of entities and which locks entities in particular positions. ANT does not only make it possible to describe which and how interests are inscribed in technology, but it also makes it possible to trace the differences between the inscriptions and the prescriptions. The aim of critique is the same as the aim of the tracing of the network as such. It shows how the powerful comes into being and how different kinds of distributions take place.

In addition to this, critique has the evaluative function in relation to due processes. The central questions in the establishment of networks, *how many are we?* and *how do we live together?*, can now be applied to the roles of technology in the network. Seeing the powerful and subtle ways in which technology operates, the question is: How does technology contribute to the acquisition and maintenance of power of the macro-actor? It should be taken into account that the macro-actor is not necessarily human or singular. The two basic critical questions could be applied to technology as follows:

- How does technology contribute to the shifting and solidification of those kinds of identities that reduce one entity to another (see Chapter 6, Subsection 3.1)
- How does technology contribute to the exclusion of certain entities

When applied to the technological object the following questions could be asked:

- How does the object gain its centrality and singularity
- What are the effects of the technological object on other entities

It will be noticed in most of the cases that the networks that are being built intend to improve service, increase accountability and efficiency, and professionalise work. In all these cases technological mediation has certain effects that were not necessarily anticipated or intended. Although programmes of actions were in place, the way the networks drift could partly be ascribed to the role technology plays. The drift is often disguised by the rhetoric of the initial intentions. Critique also has the positive function to add to reality and to care for the network.

The following quote provides the central point of ANT's critique of technology:

Instead, it seems to me that these Others will ignore us for most of the time. Instead, they will continue, as they always have, to perform their specific forms of agency to one another. And all that we can do is to say that these performances go on. And then to create appropriately monstrous ways of re-presenting them on those rare occasions when our paths happen to cross and we find, for a moment, that we need to interact with them. (Callon & Law, 1995:504)

The critique refers to the relative independent actancy of technology which performs its actions with little regard for human hopes and interests. It does not necessarily support or oppose human intentions but contributes in significant ways to the changes and orderings of the network by exerting a powerful effect on associations. The kind of actancy technology displays is not in accordance with the interests and intentions humans may inscribe into it. The otherness of technology refers to its hybrid nature and entails that it cannot be understood in terms of substantivist, constructivist or instrumentalist categories. The attribution, for example, of an essentialist nature to technology (as anti-human), obstructs the attempt to understand what kind of actancy is being exercised and what kinds of effects it may have. This chapter attempts such a 'monstrous way' of re-presenting technology. The monstrosity consists of the lack of a coherent, summative account of critique; it consists of the detail of each case study which cannot be generalised. The need for "monstrous" representations refers to the inability to simply make technology present in a way that would make all its effects transparent. Since technology gathers so many heterogeneous entities in a way that identities and purposes shift, makes it impossible to fully represent the processes involved or to fully articulate their meaning. Critique requires an approach that would be able to represent the elusive nature of technology.

Critique is needed because of the mass of hybrid entities that are brought together without adequate care and without a proper understanding of the multiple unseen translations. Since us humans are so unaware of the active role and effects of technology, we are under the impression that the technological effects are what we intended and we take these effects for granted as the reflection of our true intentions. In this process we fail to recognise to what extent the initial intentions have changed and the ways in which our identities and work practices have shifted.

In order to clarify the nature and value of a critical approach to technology, Latour (1994:249) compares it with literary criticism. Where literary criticism investigates how characters in a novel obtain an identity, technological criticism investigates how characteristics and competences are “shifted out” to technological objects. The important difference which technological criticism deals with is that technological objects alter reality in profound ways. Whereas a character in a novel needs the reader to obtain reality, a technological artefact obtains a life of its own and participates as a relatively independent actant in the network. Technology contributes in significant ways to the constitution of the network. The critique of technology is therefore in an important way a critique of the way in which reality is constituted. Whereas literary criticism is a well established field, the critique of technologies which affect the world in much more significant ways, is still undeveloped.

The main focus of the critique of technology comes to the fore in the following statement:

The fourth guarantee – perhaps the most important – is to replace the clandestine proliferation of hybrids by their regulated and commonly-agreed-upon production. It is time, perhaps, to speak of democracy again, but of a democracy extended to things themselves. We are not going to be caught by Archimedes’ coup again. (Latour, 1993:142)

The power of technology and the many ways in which this power is extended and distributed in networks, has been described in Chapter 5. It has also been indicated that the “multiplication of hybrid entities” is not adequately theorised and therefore remains in many ways invisible. This invisibility leads to the inability to recognise and describe the roles played by technology in the constitution and maintenance of networks. Technology has been defined as a “thing”, as one of the hybrids that proliferates and which plays an important role within the network. Technology is a part of the “missing masses” which makes the network durable and moral (Chapter 5, Subsection 3.3). The critical questioning of technology entails a careful look at the way technology gathers. It has to acknowledge the important role of technology in the constitution of the network. The bold way in which hybrid entities were multiplied in modernity has to be accompanied by a democratic process through which the

monitoring and articulation of the effects of these hybrids become part of the democratic process through which the networks are assembled. This democracy has to be extended to “things” so that the ways in which they shape the network could become an explicit voice in the shaping of networks.

Whereas the careful monitoring of the due processes provides the broad context of critique of the network in general, the analysis of technology in the previous chapter showed how the kinds of roles played by technology could be identified and described. If the ANT conceptions of technology are brought together with its conceptions of critique, one can start to evaluate critically how technology contributes to change and order. On the one hand, techniques bring about changes in the network by altering identities and interests. On the other hand techniques contribute to the stability of the network by inscribing interests and identities in material form. In both cases critique is centrally concerned about the functioning and effects of (techniques as) power. Not all aspects of the ordering and change through the technological actant are anticipated and intended from the human point of view. It may at times coincide with particular human interests and at others times seem to be against it.

What seems clear from the analysis in Chapter 5 is that a shift always takes place when technology is introduced. Technology never just contains the inscription of the designers and prescribes what is intended. When more or less successful, it is always a translation or a detour which effects an amplification or a reversal of forces. There is always some kind of effect brought about by technology since the technological intervention never leaves entities where they were. It has to be expected that technology changes the identity of things and that nothing remains exactly the way it was after technology has been introduced. The focus of an ANT investigation is to establish the nature and the extent of these shifts. The focus of critique is to problematise the effects of these shifts on all the entities involved.

Critique has to be careful not to negatively affect the ongoing processes through which networks are constituted because these networks make up our world (see Chapter 6, Subsection 5.4).

The work of all entities, particularly the “missing masses”, to maintain the integrity and even the morality of a network, must be respected. Without attentiveness to technologies through which the network is kept moral and stable, morality itself could be undermined. Some important ideas could disappear or fail to realise if the way they are made possible through technological mediation, is undermined. Humanity itself could be undermined through the wrong kind of critique because technology plays such an important role in the definition of the human. Critique should therefore not aim to inhibit the proliferation of technologies, but should protect technology from those who inflate, deny or diminish its role. The question is therefore not whether humans and technology are mixed or whether technology takes over human functions, or to what extent humans are shaped by technologies but about the exact nature of the transactions and how distributions take place.

3. The voice of technology

While this general account in the previous section provides some of the themes and foci of the critique of technology, it has to be shown more concretely how critique might function in relation to the development and functioning of particular technologies. The first account draws on the extensive empirical study of Latour (1996a) in which the voice of technology is articulated.

We have seen that the “voice” of technology remains unarticulated in the studies of technology. In order to ensure that due processes are followed, and because technology plays such an important role in the ways in which people associate, the democratic processes have to be extended to things. The silent way in which technology functions makes it so much more important to articulate its “voice”. This voice consists of the proposition which technology makes about itself and its impact on the rest of the network. The technological voice is an important addition to the pin board because of the crucial role it plays in the constitution of the network.

Because of the non-verbal nature of material representation, it is not possible to fully articulate the social meanings embedded in technology or to deconstruct technology in linguistic form in an attempt to uncover the way it shapes the entities in the

network. The “monstrous representation” shows how power is translated between different kinds of entities. Once the voices and effects of things are brought into the open, the scope of democratic participation could be expanded. It is not only an “open and free” communication between humans, but includes silent and powerful nonhumans as well. It has been shown (see Chapter 6, Subsection 7.2) that the restriction of this conversation to only the audible voices of humans, limit our chances to understand how the “status quo” came into being and how it is maintained. The voice of technology should not be ignored because it comes from entities whose powerful role in the network is usually misunderstood.

Latour (1996a) illustrates how the articulation of the technological voice could be done by acting as the spokesperson for what *Aramis* could have said to the engineers and planners at whose hands it failed to realise. This voice could have made a proposition to inform others who/what it is or is not:

They wanted to keep me pure of all compromise. ‘Be suspicious of purity, it’s the vitriol of the soul.’ They wanted to keep me nominal, as they put in. Noumenal, rather. Well, too bad for them, since because of that insistence on purity, what am I? Nothing but a name! And what a name, by the way! How could they stick me with the name of that moustachioed swashbuckler?
(Latour, 1996a:295)

Latour provides here the voice of the technological entity as part of the investigation why the project failed. If the building of networks are important, as claimed by ANT, then critique should also be interested to know why they fail to realise and when they fail to contribute towards a moral order. The moral order this project intended was one where traffic congestion and pollution in the city could have been reduced, where less fossil oils would have been used and where people could simultaneously use a mass transport system while maintaining their privacy. It is only now, more than 30 years later that serious attention is being given to the development of a private vehicle not driven by increasingly scarce and environmentally unfriendly fossil oils.

In this case people are accused of not “loving” technology enough and of discarding it too easily. They did not listen to the technological voice, but were too wrapped up in their own programmes. Ignoring the multiple silent (silenced) voices is at the peril

of everyone. *Aramis* does not present itself as a strong and autonomous potential technological object, but as fragile and compromised in the process of making. A better reality could have been created if this voice has been listened to as suggested in this case because a similar project came into existence elsewhere (Latour, 1996a:301).

The articulation of the technological voice is important to realise what effects are brought about through technological mediation in a particular context which underlies all examples of critique discussed in this chapter. The articulation of the proposition which technology makes is a precondition for its critical evaluation. Conscious decisions cannot be taken about the role of technology if their proliferation remains silent and clandestine. The voice of technology does not only articulate their potential powerful effects on the network, but could also articulate how they could benefit others. Although a spokesperson is needed, the voice can never be adequately represented by anyone. In this case the critique of technology discovers a moral order that did not realise.

4. Changing identities

An important focus of critique is to show how responsibilities and identities are reallocated in the distributional processes. A large body of ANT related empirical studies has emerged in which the effects of information systems in organisations are traced. These studies illustrate the difference between inscription and prescription, what is intentionally designed into the information system and what effects it has through the behaviour it prescribes to others.

Changing work practices is one way to shift responsibilities and identities. Bloomfield & McLean (1996) investigate the design and implementation of Care Manager System, an information system in the National Health Service in the UK as part of the implementation of a Care Programme Approach which focuses on patients outside institutions. They locate this System against the background of trends in recent psychiatry which emphasise the wholeness, integrity and autonomy of the person. It is motivated by a notion of empowerment and recognition of the rights and

sovereignty of the mental health patient (*ibid.*, p.376). A more holistic approach is followed to the care of patients who are not institutionalised any more, but remain in the community. The System wants to ensure an equal distribution of services and the identification of all the needs of the patients.

In order to provide these services detailed information is needed about each patient. This information is not only of a clinical nature, but includes social, cultural and practical aspects of patients' lives. To manage all the information, an information system has to be employed. This resulted in the introduction of information management in psychiatry. Central in these information processes is the form which the "keyworkers" had to use to capture the profiles of the patients. The keyworkers who are relatively low skilled officials, complete the forms through consultation with the patients. This involvement of the patient is seen as an important element of the System. The patients have to participate in the identification of their needs and to take responsibility for the information that is gathered about them. The patient is produced as a particular kind of choosing and rational actant. Through categories contained in the form, patients' details and medical needs are gathered and organised.

This critical analysis of the case study focuses on the technology of the form. The form is the technological actant in which the range of possible needs of the patient is inscribed. The form therefore defines the participation and performs the autonomy and rationality of the patient. In this process the interests of the patients are translated into the categories provided by the form. The intentions of the Care Manger System are mediated through the detour of the technology of the form. While the aim was to promote a level of standardisation and efficiency through the predefined categories, patients' needs are already predetermined. The projection of patients as autonomous and participative in the establishment of their needs makes them responsible and accountable for what is captured on the form.

The study is an example of a critical ANT approach to technology because it makes it possible to problematise the effect of technology on the nature and effects of a particular system of health care. While the motives of patient integrity, self-

management and responsibility are certainly important in a health care system that aims to be emancipatory, the outcomes of the process shift once the technological mediator enters the scene. It is clear that the form is a powerful and central actant in the psychiatric process. It defines the needs of patients, captures their accountability and enables the relatively low skilled keyworkers to diagnose and assess patients.

Bloomfield & McLean (1996:386) show that the technology of the form plays a role to construct psychiatric practice. The keyworkers are interpellated as information managers concerned about the correct completion of the forms. The psychiatrists found that their practice has changed. They experienced an overload of paperwork and commented: "As we spend more time filling in forms there is less time available for patient care" (*ibid.*). Communication with the patient is not so much informed by professional interests and competence, but it is shaped by the need to complete a form. The form produces the framework for the communication with the patient. The result is that mental health care has become a form of information management (*ibid.*, p.378). Psychiatric diagnosis is determined by what could be captured and processed by the technology. The strong inscription in the form did not adequately represent the patients' needs since some of them withdrew from the process that intended to empower them.

This critique does not have the intention to disband the technological intervention, but to show how technology contributes to the drift in the network and to the way work, agency and responsibility are redistributed. It seems that the introduction of technology does not simply lead towards either increased surveillance or enhanced emancipation. The authors describe how IT could also be a "source of oppression and control". They ask the question whether IT is "enslaving or emancipating" (*ibid.*, p.372). They do not use a narrative of empowerment but focus on how "subjects are constituted as empowered" (*ibid.*). Although psychiatric care moved out of the psychiatric ward into the community, the attention shifted in a holistic way to patients' needs, and patients participate more actively in their own diagnosis, it does not imply empowerment and emancipation in a simple way. The patients are constituted as autonomous, independent, responsible for themselves and for their diagnosis. Technology became a necessary means to achieve these goals and, typically,

constitutes a detour which introduces different goals and unintended effects some of which seem to be clearly undesirable. This is, for example, the case when psychiatrists found themselves dealing more with forms than with patients which undermined their primary professional focus. It also seems that patients withdrew from the process because the technological actancy might predefine their needs too strongly.

The material inscription of the categories provides stability and irreversibility and once the forms became a black box they would generate some of these outcomes by themselves. It is clear that the technology of the form exerted a kind of actancy which added new “intentions” and goals. To the initial purpose of processing information effectively was added a new definition of knowledge as what could be processed by a form. In this process the kinds of information which are not included in the predefined categories may become invisible. The forms operated as actants which defined the needs through their classification system. Information management reshaped the patients’ needs, the role of the keyworkers and of the psychiatrists. Forms and lists mediated the assessment and interpretation of patients’ needs (*ibid.*, p.374). As such they also excluded needs for which the forms did not make provision.

The critical approach in the study is still limited because it could have followed the actors more meticulously. It could have included the narratives of the patients who might have elaborated on the effects of the technology which lead to the withdrawal of some. This might have indicated that the technology attempted to translate their interest in ways they do not feel comfortable with. This would indicate that the “irreducibility” of the patients is affected in an attempt to reduce their needs to what is contained in the forms. The technology also prescribes to patients a form of rationality and choice that they may feel uncomfortable with. One could also listen more to the testimony of the forms which faithfully captured a wide range of patient needs and stored it patiently until it could be retrieved. The information system could testify to the way it placed psychiatrists in a discretionary position from where decisions about patients could be taken.

This case illustrates how technology contributed to the redefinition of the patient and the psychiatrist. It also created the new identity of the medically unskilled keyworkers who could perform a relatively high level function and illustrated changed work practices.

5. Changing work practices

Change relates to the ways identities and work practices are being shifted through the introduction of technology in the network. The study of Bowker, Timmermans & Star (1996) on the effects of the development of a classification system on the attempt to professionalise nurses' work is an example of the contribution of technology to change and order. The authors illustrate the powerful ramifications of such a classification system in the reshaping of work practice and knowledge, and how "moral and ethical conflicts are resolved" (Bowker, Timmermans & Star, 1996:345). The need for professionalisation is regarded as essential in a context where the work of nurses is negatively defined in relation to what is not done by physicians. The authors show how the professionalisation of nurses' work is promoted through the development of a classification system. The Nursing Intervention Classification (NIC) was developed in a participative and inductive way by experienced and well-respected nursing researchers. It identifies and describes the terrain of nurses' competence and autonomy by identifying

a list of some 336 interventions each comprised of a label, a definition, a set of activities, and a short list of background readings. Each of those interventions is in turn classified within a taxonomy of six domains and 26 classes. For example, one of the tasks nurses commonly perform is getting a patient emotionally ready for a risky and painful treatment... (*ibid.*, p.348)

Through this kind of detail, the NIC inscribes nurses' work "in the technical content of the classification system" (*ibid.*, p.350). This inscription prescribes the work of nurses and includes it in the curriculum of their training. It also provides a standardized language for diagnosis and treatment of patients which enabled comparability across different locations.

The classification system operates as an actant which does not merely reflect the existing work of nurses, but also redefines it. As such it is an example of the entanglement of humans and nonhumans in which competences are interchanged and distributed. The classification system defines the actor-network of the nursing profession by formulating the basis on which members are enrolled. It is located in the gendered power struggle between the work and status of (mainly male) physicians and (mainly female) nurses. It attempts to create a terrain in which nurses' autonomy and freedom could be defined. It provides an example of how issues of professionalisation are centrally involved in the balancing act of classification.

The critique of the health care network cannot be limited to a critical investigation of the ideologies of gender and bureaucratic power but should include the role played by technologies which act to "change the very nature of what it is to *do* work and what work will count" (*ibid.*, p.351). The classification system is a technology which does not merely function as a tool for predefined intentions, but mediates meanings as an actant in itself.

This study reflects a critical account of technology because it shows how the process of describing and identifying nurses' work is shifted out to classification technology. It demonstrates how the technology itself functions as an actant. Typically of an actant it leads to effects that were not anticipated and contributes to the "drifting" of the network. Although the intention of the classification was to professionalise and protect nurses' work, it may have undesired consequences. The authors state that the NIC might be used "against nursing professionalization in some computerization and surveillance scenarios" (*ibid.*, p.362). This is particularly a risk in the light of the bureaucratic state's interest in control (*ibid.*, p.363). It could render public what is regarded as "intimate" by the practice. The study traces the network in such a way that the drift can be followed. In this process the possible consequences of the hybrid network become visible, heeding the appeal of Latour to monitor the effects of the multiplication of hybrid entities.

Since the NIC is still being developed, it has not yet become a black box. The study has indicated, however, the possible ways in which the effects of technology are ambiguous and that it needs continued scrutiny during the development processes. The critique of the NIC could draw on Foucauldian theories of the intrusive power of surveillance technologies or on theories of bureaucratisation to demonstrate the problematic nature of a classification system. While these theories may assist to sensitise the researcher, they may overlook the moral order which the classification technology constitutes.

6. Complete control

Whereas the previous two studies showed how a critical approach to technology traces how identities and work practices change, the investigation of the study of Orlikowski (1991) illustrates how technology is used to intensify managerial control and what the effects are on the identities, work practices and the organisation as such. The purpose of this investigation is not so much to criticise the limitations of Orlikowski's approach, but to investigate what an ANT approach to the critique of technology would look like. The study has to be seen against the background of Orlikowski's preference for structuration theory when she sees information technology is "an occasion for structuring organizations" (*ibid.*, p.13), and when the transformative action of the consultants lies in their ability to "choose differently".

The article shows that the belief in the decentralising power of technology is ill-founded and that technology could be used to reinforce the bureaucratic nature of organisations. Orlikowski describes in this study the work of software consultants of the Software Consulting Corporation (SCC). The consultants use a very prescriptive methodology in their work and are strongly socialised into the culture, practices and ideologies of the company. A strong bureaucratic form of control is present through which consultants are closely supervised. The control is not only directed at their work, but also their dress, ideas, and free time. The surveillance of consultants is also closely related to performance appraisals. The strength of the organisation

culture is further reinforced in that the work practices of the consultants are mainly defined within the organisation and not by professional bodies outside.

SCC introduced Computer Aided Software Engineering (CASE) technology, which they called the “productivity tool”, to streamline and automate the work of the consultants. This tool made it possible for the work to be done in a much more effective and standardised way. The strong methodology, the work practices, and the knowledge and skills of consultants were encoded in the tool. These inscriptions made it unnecessary for the consultant to have any knowledge of programming languages and database management.

The productivity tool reinforced the methodology and increased the bureaucratic control of the organisation. Previously, consultants had some flexibility in that they could work around some of the procedures prescribed by the methodology. It was also possible for them to use their discretion when the methodology did not provide the results they wanted. With the productivity tool they had very little choice but to work strictly in accordance with the embedded methodology. The tool would show immediately when the strict sequence of procedures were not followed. “The tools prohibit execution of tasks unless all the prerequisite work (defined in the methodology) meets the tools’ completeness criteria” (p.25). One of the reasons for introducing the tools was to prevent consultants from being too creative or to use their discretion and professional knowledge. Since the methodology was black boxed in the tools, it was not as visible as it used to be. Consultants also found it much more difficult to interpret the methodology differently. They were now placed in a position of passivity where they could not reflect on their own actions any more.

From the perspective of managers, consultants could now work in “factory mode”. The managers felt that they were “no longer dependent on knowledge in people’s heads” (p.24) since the knowledge was encoded in the technology. The productivity tool also enabled the managers to supervise the work of consultants more closely and more efficiently. The concept “leverage” was used to indicate the ratio between the managers and the consultants. The improved efficiency of the managers was related to the ratio that increased from 1:5 to 1:20 after introduction of the tool. The

surveillance role of managers now became simultaneously more intensive and less obtrusive. The work of the managers therefore changed in that they had to be computer literate in their responsibility to manipulate the data.

Orlikowski clearly shows in this article how technology functions as an actant. The technology fits perfectly with the intentions of managers by tightening the control and reducing possibilities for alternative action. The tools also became the main means to socialise new consultants into the methodology. These new consultants were unaware of the embedded methodology when they were taught to master the tool. The “invisibility” and silence of technology were achieved by means of the user-friendly interface which contained various menu options. The user was given the impression that various choices were available, but did not realise to what extent a strict sequence was to be followed. The actancy and some of the effects of the technology could be seen in the following statements of managers:

Tools allow us to do what we are always trying to do in SCC, to push work down to the lowest skill level possible. They allow a factory mode of operating. (p.27)

Productivity tools allow us to leverage inexperienced people on our project. So we can take a kid out of school, let's say with a major in English, and in a very short time he can achieve high productivity, that is, achieve the productivity level of a client programmer with ten years' experience. (p.28)

It seems then that the tools presented relatively inexperienced people as professionals and shortened the period of professional training. The tools made it possible to combine the contradictory requirements of delegation and control. Work was delegated to a lower level while control of the execution of the work was increased. The tools contributed to the distribution of power and privilege. The actancy of technology in the shaping of the mental world appeared in the different experiences and perceptions of the older and newer consultants. The old consultants found that they could no longer perform a task differently from what was prescribed in the methodology. New consultants, on the other hand, were not even able to think about such alternatives. Consultants were also forced to “think short term” (p.31). Orlikowski comments on the use of the concept “tool” in the language of the advocates. The use of the concept emphasises the instrumental role of the

technology and negates the “socially constructed essence, and the unanticipated effects of technology” (p.29).

The strong actancy role of technology described here should not be seen in isolation. It is only possible for technology to be a strong actant if the network within which it functions is well aligned. Control is intensified if it is inscribed into a heterogeneous network. Orlikowski portrays in this study a network in which not only the tool, but also various other entities are enrolled such as managers, junior and senior consultants and clients. It is clear in this study how technology is part of a well aligned network which produces particular effects. The network is made up of

hierarchical authority, rhetoric of professionalism, disciplined work practices, aggressive schedules, “up or out” promotion, high turnover, and short-term focus on current engagements and profitability. (p.25)

The alignment of the network is increased when consultants are recruited from college and only trained in the use of the methodology depriving them of any external reference point or alliance with a professional body.

The study of Orlikowski is critical since she identifies the way technology reinforces managerialism and bureaucratic control and diminishes the professional and reflective work of consultants. The critique of technology present in this study shows how order is created through the strength of inscriptions in material form and how inscriptions grow stronger when they become part of a heterogeneous network. An alignment exists between the effect of the tools and the stated objectives:

A review of SCC’s stated objectives behind the decision to deploy information technology indicates that these results are largely consistent with the objectives. SCC management wanted productivity tools to reduce projects’ need for managers and technical skills, to improve the efficiency and productivity of projects, and to increase the substitutability of consultants. (p.33)

Once the inscription has become strong, alternative action is more difficult and seemingly impossible. Orlikowski comments on a range of further dominating effects of the tool, such as the deprofessionalisation of consultants’ work, the way clients

are bullied, and the limited ability to change work practises in a context of rapid changes in software.

The focus on technology is for Orlikowski an important element of critique because of the role of technology in this organisation. The description of the ways in which technology contributes to managerial power informs the consultants of the extent to which they are controlled and to which they participate in this control. It aims to create an awareness of the resources and opportunities they have available for alternative action. Her basic assumption is that agents, once informed about the real factors that shape their work, would be able and willing to change it. The alternative action of consultants is described as follows:

If consultants choose to develop their own tools or choose to neglect the sanctioned tools, SCC's control mechanisms lose their effect. Thus, while the autonomy of consultants may have been limited by productivity tools in some areas, in other respects they have gained power, as they have a key arena within which to express their disaffection. (p.37)

The consultants could “socially construct” their interpretation of the tools differently and could resist the imposition (*ibid.*). The potential of human agency to act or choose differently is an ever present possibility in Giddens’ framework. The question that is not adequately answered in this framework, though, is about the conditions and sources of the alternative thoughts and actions. Where does this initiative come from and could it be a purely human invention?

From an ANT perspective, Orlikowski’s account of critique is limited because she only acknowledges, in constructivist fashion, the inscriptions in the tools and the prescriptions that follow from that. She does not recognise how the tools effect changes that were not intended (although not always unwelcome from the managers’ perspective). Orlikowski does not acknowledge the active role of technology and classify these effects as “unintended consequences” (see Chapter 3, Subsection 6.1). If the human choice to act differently is not seen as a purely human activity, but already mediated within a heterogeneous network, then transformative action could not be based on pure human decisions. If a notion of transformation is used that does not rely on a substantial understanding of a transformed state, then the best critique can do is to contribute towards the creation of conditions that might

be favourable for transformation. Such favourable conditions are created when the seemingly closed, tightly knit, powerful network is shown as contingent, fragile, multiple, complex and conflictual. The complexity of a network cannot be captured from any particular point of view since no perspective could be privileged. The purpose of this critique is to show how the macro-actant came into being and how it is contingently composed. It shows how many “empty spaces” exist which may make different translations and alliances possible. The critique has to show that the seemingly tightly woven methodology is full of gaps and jumps. Alternative action might come from different directions.

This critical approach could be strengthened by means of some of the ANT strategies of critique. Particular attention could be given to the critique of the technology such as the productivity tool. Some of these strategies discussed in Chapter 6 are the tracing of the different actants and the articulation of different voices, the evaluation of due processes and the juxtaposition of multiple narratives.

All the translations which resulted in the productivity tool could be followed in order to establish what kinds of reductions and betrayals took place. Some glimpses of such betrayals are presented in the study as expressed by the senior consultants, or of the clients. ANT makes a more detailed analysis possible because it provides the tools to test the trial of strength of each inscription and translation by asking whether each inscription is really as strong and impenetrable as it appears. The articulation of the translation through a narrative provides a particular perspective by those whose interests are translated. Orlikowski presents the voice of the consultant:

The methodology and the training turn us all into clones. And of course, SCC wants us to be clone-able, because of the high turnover. So it can replace me if I leave tomorrow, else it can't turn out the service level it wants to. (p.28)

The biggest problem with SCC from the point of view of the personnel is that it is a very dehumanizing firm. We are all just drones here. (p.32)

Orlikowski also presents an account from a client perspective that is placed in a position of passivity (p.30). But, not all the voices are fully explored. The voice of the methodology might reveal whether it is faithfully translated into the productivity tool.

The voice of the client is largely silenced in the use of the tool because they are “bullied” into the use of the tool with the threat that the development would cost much more if they do not comply with the dictates of the tool. They have to substitute their traditional ways of working with that prescribed in the tool. They may show how their complexity is reduced to the employment of a particular methodology and how their “social, political, and informal arenas” are excluded (p.30). The junior consultants may express the opinion that they do not have real insight into the assumptions of the tool and do not have a proper understanding of the methodology (p.36). Another possible voice could come from consultancy as a practice who may testify to the ways in which it is being violated in the standardised processes in SCC and that it is deprived of the opportunity to extend its standardised practices and codes of behaviour to the consultants in SCC. Orlikowski’s reference to accounting practices which have a particular professional code, may refer to another technology that might become an alliance, that of professional standards for consultants which could be compared with the standards that have been set for the nursing profession.

The voice of technology has to be articulated more clearly. The productivity tool may portray a perspective on its work as an efficient executor of a particular interpretation of the methodology. It may reveal what it can and cannot do. It might for example say that it cannot solve all the problems in an organisation and that it is placed in the wrong position by being used to diminish the professional judgement of the consultants. Technology could also have said: “I have a very particular interpretation of the methodology and would not allow any other interpretation”. The tool could say that it is more interested in how to do things rather than what it is that should be done (p.30). The productivity tool is not only the means through which the methodology is standardised, skills replaced, profit margins increased, but it also has effects that were not anticipated. The technology became a strong agent which pushes the firm into standardised solutions, loss of professional judgement and the marginalisation of the client. Orlikowski shows that technology has no deterministic effect on the organisation. It does not just informate and decentralise, but could also centralise and increase surveillance and control. She shows how the control of the

organisation became more intensive and tight. In this process the “Leviathan” is portrayed.

7. Due process

The study of Scott & Wagner (2003) is used to illustrate the relatively successful operation of a critique of technology which threatened to undermine certain academic work practices. It illustrates that the critique of technology cannot come from an isolated human agent, but only from a human-technology network. The critical strategy of due process is used to evaluate the role of technology. Scott & Wagner employ an ANT approach to trace the implementation of an Enterprise Resource Planning (ERP) system in an academic institution. The study investigates the processes of change and ordering by focusing on how the “temporal zones” associated with the new technology interfere with the various “temporal zones” of the academic institution. The study is based on the articulation of multiple narratives including some of the “silent voices”. This discussion of the study focuses more on the role of technology as part of the heterogeneous network which is not the explicit focus of the authors.

The decision to introduce the technology originates from Oracle’s wish to develop an ERP for tertiary institutions, and the desire of the university management to keep abreast in the competitive tertiary education market and to be instrumental in the development of a “golden standard” for the administration of tertiary academic institutions. It was introduced by the management team who portrayed it as a timeous innovation. The Vice Principal (VP) created the notion of a “temporal zone” where “global times” are related to local organisational times. The expected crisis of the Y2K phenomenon was an incentive to replace the legacy systems. The VP chose to align himself with industry instead of with the diffused network of grass roots developments in the university (p.299).

The technology was part of an aligned network consisting of various actors (p.289). It was developed by Oracle and has become a major actant in business environments. The implementation of the technology was accompanied by the belief in the ability of

technology to transform the culture of the organisation. The analysis of the actancy of technology resulted in the following statement:

The sum was a compelling temporal zone that conscripted local and global nonhuman actors into an extended network announcing the sources of legitimacy for his leading-edge logic (p.299)

The aligned network “dismantled” other groups such as the supporters of the legacy system, in the processes of their enrolment within the new network. The university community was enrolled on the basis that the technology would assist them to cope with the various demands. The technology did not only promise to bring about more efficient work procedures, but also involved changes to the identity and future of the institution. The technology did not only convey this identity, but represented it.

Ivy’s understanding of its past and potential futures was re-ordered by the launch of the initiative. (p.300)

The way in which the new system attempted to shift their identity became clear in the following statement by a senior financial manager:

I would say that the mentality that we’ve had ... for managing is **primitive** to say the best and it’s very old-fashioned ... the corporate world left it many years ago ... Many faculty ... think of things **fundamentally wrong** ... we want to move people towards a management model where we’re going to ask [them] to put together a time-phased business plan. (p.305)

The technology entailed changed work practices, such as the accounting practices of faculties. A new “corporate” way of research planning was inscribed in the new system.

The initial goals to fully implement all aspects of the System at the start of the 2000 fiscal year, were replaced with a partially developed and implemented system. The failure to fully implement the system and the inattentiveness to local needs lead to various other difficulties experienced by faculties. They experienced uncertainties regarding their work practices and a disruption in research plans. They were also concerned about the use of resources for an administrative system that did not serve their needs. (p.305)

The implementation of the technology encountered resistance from the medical school in particular which resulted in the development of work-around technologies. One of the most important needs of faculties was the generation of financial reports indicating to Principal Investigators (PI) how much research money they had left. Since the new system could not generate these reports, faculty officials created their own work-around technologies according to their “process-based working rhythms” (p.307). In this process faculties succeeded in protecting some of their work practices.

The article represents a critique of the view of technology as a powerful actant that changes the network within which it is introduced. This strong presentation of technology hides in some ways the networks of which it is part and the network processes that are needed to establish it. The study also shows how some work practices are negatively affected by this technology. The authors argue that the powerful technology did not simply win the battle, but that a new order was created which consisted of compromises between the old and the new system. The new (dis)order came about through the resistance of the human-technology network of faculty administrators who protected their own work practices.

The article does not simply investigate an information system that failed to meet its deadlines, but rather one where an identity and work practices were created which clashed with existing ones. It also shows that the success of a technologically driven project is not guaranteed even though it appears to be powerful and well-connected. The faculty that resisted the technology was well placed within the network of the university.

From an ANT perspective, this critique could be made more specific when the whole process is evaluated in relation to the requirement of due process (Chapter 6, Subsection 7.2). Such an evaluation reveals that various aspects of due process were not followed. The requirement of *consultation* demands that “the number of voices that participate in the articulation of propositions is not arbitrarily short-circuited” (Latour, 2004b:109). In this case the voice of the new technology was not adequately articulated. The spokespersons of this entity made various claims in its

name such as that it represented best practices and would ensure a competitive advantage and more efficient procedures. It did not state explicitly that it regarded the PI as of less importance, that it was not concerned about many of the practices of an academic institution, and that research processes should follow business plans. A proposition was also initially made on behalf of the technology which states that the changes would be merely of a technical nature. This proposition hid the fact that changes to the identity of the organisation as such were implied in the technical detail. The voice that was not listened to was that of the legacy systems which could have stated which work processes they respected. The strong inscription of the rhetorical language of project in the initial stages was successful to insulate the negotiations that led up to the purchase of the product (p.301) and early on created a situation of irreversibility. This early closure of the debates inhibited the due consultative processes (see Chapter 6, Subsection 7.2).

Because of the failure to meet the requirements of *consultation*, the requirements of *hierarchisation* could also not be met. This requirement entails: “You shall discuss the compatibility of new propositions with those which are already instituted, in such a way as to maintain them all in the same common world that will give them their legitimate place” (Latour, 2004b:109). It is clear from the previous paragraph that the full impact of the new technology on the rest of the institution has not been properly discussed. Some discussion took place, but the spokespersons did not fully articulate the interests of the represented and consultation with significant participants was left for very late in the project. Within the requirement of *hierarchisation*, questions about the distribution of work, attention and risks could also have been asked (Vikkelsø, 2005:25) (see Chapter 6, Subsection 7.2).

The slow process in which the propositions of the new entity should have been articulated and subjected to a jury was replaced by strong and rhetorical advocacy. The advocacy contained elements of *problematization* and *interessement* which aimed at the quick enrolment of others. In this advocacy a future was created for the institution and inscribed in technology without consultation with academic faculties. Since any anticipated future contains privileged identities and work practices, interests had to be translated in order to promote alignment between actants. It

shows how a new identity and work procedures were inscribed in technology in order to prescribe behaviour to faculty administration in line with the envisaged future.

The account of Orlikowski discussed in the previous section, showed that a system is never as coherent as it might appear and that many “empty spaces” exist which makes alternative action possible. In this case the empty spaces were exploited by a faculty that found itself in a strong enough position to resist. The resistance came from an alliance of faculty officers and their workaround accounting procedures which proved to be more reliable than what was offered by the ERP. By reporting on the “empty spaces” in the network and the way the faculty resisted the translation and enrolment strategies, the research itself contributes to performance of alternative actions.

The failure to follow due process resulted in various kinds of resistance and the eventual failure to develop and implement the technology to the full. The resistance was not against the technology as such, but against the way in which the various interests were neglected. The “interpretive flexibility” of any technology entails that it could have taken a different role if the network were to be developed differently. This case study shows how the politics of due process needs to include the participation of things.

8. Macro-actant

This section focuses on the way critique could approach the growth and demise of the macro-actant. The account of Kallinikos (2004) provides a typical example of a view of technology that immunises itself against critique and the account of Law (2002) illustrates how a powerful technological object could be decentred.

8.1. *Inflating the macro-actant*

The article of Kallinikos (2004) is not an example of a critical approach to IS, but is included here to illustrate how the account of the macro-actant as totally different from micro-actants precludes the possibility of critique. The account could, however be reinterpreted in order to make a critical analysis of Kallinikos’ conception of

technology possible. As with the case study in Section 7 above, it also deals with the deployment of an ERP in an organisation.

Kallinikos follows a technological determinist approach in his description of the development of ERP technology. The technology enables a real time and overall assessment of all transactions in a way that crosses the boundaries of different functions. The factors that contributed to the development of this technology are the developments in computer hardware, and technology such as relational databases and functional understandings of the organisation. Kallinikos claims that the development of the technology is independent of any particular organisation, but prescribes very strongly to any locality the roles attributed to all the entities enrolled in the system. Kallinikos sees technology in a substantive way as a self-referential entity. This refers to the way technology creates an own reality by projecting a world outside of itself, and reacting to this projection. On the basis of its self-referential nature, the technology is seen as purely technical and is not being influenced by the social context within which it is employed. It is not adequately acknowledged and problematised how other entities are socialised into this system. The system that results is seen as a necessary development of the inherent logic of the technology. In this way technology is seen as a black box which could not be opened and deconstructed.

Humans are enrolled into the technological system and redefined. They are deprived of emotions and prescribed into an instrumental role. Human agency is transformed to fit into the organisation as procedural machines (*ibid.*, p.155). There are only “selective forms” by which technology admits human participation.

Although Kallinikos may provide an accurate description of an ERP in some organisations, it does not attempt to trace the way the network came about. In order to develop a critical perspective, the question needs to be asked how this particular technology obtains a self-referential nature, or came in the position from where it could prescribe so strongly selective behaviour to users? How is it possible that the attributes of emotions are so successfully eliminated from humans? What are the

configurations that make the ERP so strong that humans are separated from their other interests and reduced to a particular role in the network?

Whereas Kallinikos states that it is necessary for the local context to be “re-engineered” in order to make the technology operate effectively, ANT emphasises the contingency of the role of technology in any particular network. One cannot draw conclusions about the essential nature of technology from its contingent role in such a network. The study of Kallinikos illustrated how the presentation of technological processes as necessary, disallows a critical investigation into the contingent way of how power is accumulated and displaced outside the local context. Technology is placed in such a way that it exerts a certain power, projects human users in particular ways, creates certain kinds of discretionary space, etc. Although humans may resist the technology, the battle is already decided in the favour of technology (*ibid.*, p.157).

The demands of due process are often bypassed such as when Kallinikos (2004:146) states that the “speed and comprehensiveness of change taking place today defy the languid, time-consuming forms by which situated practices develop”. Although modern technology is characterised by the increasing speed of change to the constitution of the network, it remains essential for its morality that due process still be followed. Every change, however rapid it might be, should be accompanied by accounts through which the processes of mediation are investigated.

8.2. Deflating the macro-actant

Whereas the macro-actant is portrayed as a powerful entity in itself independent of any context, Law (2002) demonstrates in this study how the juxtaposition of narratives in a pin board fashion could be used as a means to critique the technical object, in this case the fighter plane, the TSR2. We find in Law’s approach a deviation from those ANT studies which show how the macro-actor came into being through the enrolment of others. Law does not simply deconstruct the object through multiple narratives; neither does he tell a coherent story about the dominating effect of the object. Critique consists here in the portrayal of the object as fractional, simultaneously unitary and multiple. The TSR2 could neither be portrayed as a

singular object nor as multiple objects. The strategies that are used to present the object as a singularity are explored by Law. The singularity is not a feature of the object as such, but it is performed from a particular subject position. In opposition to these attempts to centre the object, Law shows how the aircraft as a technological object could be decentred. In order to achieve this it has to be shown how the singularity of the object is performed by the suppression of multiplicities. Law illustrates this by means of an analysis of the brochure about the TSR2 where the object is presented as coherent and linear. Law argues that the object cannot simply be deconstructed into its multiple parts as an attempt to indicate how contingent and fragmented it is. Such a view of the object hides the fact that it might still cohere in spite of the contingent composition and it might still exercise devastating power. Law (2002: 202) illustrates how an alliance of incoherent spheres of power could strengthen oppressive relations by means of Latour's (1988) account of colonial power. Latour argues that although the colonial power consists of military, political, economic and missionary spheres which do not share the same ideologies, the alliance of these disparate elements makes it even more powerful. Law (2002:11) comments that

there are partial and subtle connections between distributions that help to secure dominance and reproduce the established disorder.

As the interferences of waves create powerful summits, the interferences between the multiple narratives of the object create it as powerful and singular.

It is therefore important for Law that the object must not simply be shown as multiple, but that the way interferences exist between the multiple narratives of the object to create a powerful complex object. The origin of the powerful effect of the object is not yet exposed/unmasked if it is shown to be multiple. The arbitrary nature of the dominance could only be seen if the ways in which the different versions/accounts of the object collude to perform the singular object are understood.

Law demonstrates how the brochure of the aircraft "coordinates different objects" into a singular object. The singularity is produced through, for example, the table of contents which lists different functionalities such as "performance" and "operations"

in hierarchical order and presents them as coherent (p.18). These functionalities are portrayed as elements of the TSR2 which operate harmoniously. In this process the table of contents hides possible incompatibilities and impossibilities. It leaves certain things out that would be rendered as “technical detail” and therefore not needed to be included or explicitly discussed.

The juxtaposition of different functionalities in the tables of contents creates such a powerful interference because it suggests that all the powerful functionalities could be combined in one aircraft. It could be all of the following: fast, flying low while remaining stable, carrying nuclear bombs, a weapon system, having a wide range, On top of this it is aesthetically appealing. The logical and coherent structure of the table of contents hides the possible incompatibilities of the different functionalities.

Critique shows how the different elements are put together to create the powerful singular object. The vulnerability of the aircraft, for example, is portrayed in such a way that the agency is only allowed to the Other (enemy) if it could be countered and if it could be redistributed back to the aircraft (p.129). The aesthetic narrative is employed to reinforce the agency of the aircraft (p.131). Nature is presented as vulnerable and passive in relation to the powerful and active aircraft. The creation of the agency of the aircraft is therefore done through the distribution of passivity to others (p.140).

The contradictory nature of the different narratives is not a problem for the portrayal of the object as singular, as long as they are kept apart. But once they are brought together and related to each other, their incompatibilities appear. When this happens, it became clear that the links are tenuous and that many empty spaces exist which were made invisible. It also became clear that “any singular object immediately becomes an effect – a more or less precarious effect” (p.33). Such critique would show that the powerful has “feet of clay”.

The alternative to singularity is therefore not multiplicity, or the multiplication of singular narratives, but the maintenance of the tension between the singular and the multiple. The critical process is an oscillation between the singular and the multiple

which do not remain with any of the poles. Critical knowledge is gained by fractional knowing (p.4) by a “difficult subjectivity”.

Working in this way has a cost: we do indeed lose the possibility of an overall vision. But at the same time we also create something that was not there before: we create and make visible interferences between the stories. We bring new and unpredictable effects into being, effects which cannot be predicted or foretold from a single location. New forms of subjectivity. (Law, 2002:5)

Instead of the centring of the object, ANT makes fractional coherence possible.

“Fractional coherence is about drawing things together without centring them” (p.2).

Critique does not provide a perspective of the object, but has ontological implications because it performs the multiplicity of the object. The pin board is different from the narrative in that it performs the complexity and coherence of objects.

Critique does not prescribe the perspectives these subjectivities should provide in order to achieve a state of emancipation. It could be said that the possibility of emancipation lies in the discovery of a new subjectivity which is not fully enrolled in the network. The critique also opens the door for other subjectivities within the apparently closed object. Critique therefore does not condemn the object on the basis of perceived deficiencies, but shows how the object is heterogeneously and multiply constituted. It shows how the object could be described from (some of the) different subject positions (because the process cannot be exhaustive). It is not possible to devise a programme of critique which identifies false ideas and clearly identified forms of domination and oppression. The critique opens a space from where different subjectivities could see themselves and start to provide an own narrative of the collective.

The ability to provide a critique of the technical object is made easy in the case of the TSR2 which failed to realise and whose inner tensions came into the open. It is much harder in the case of “successful” technology where everyone colludes to present it as singular and not to be tampered with.

Law does not focus so much on tracing the actors because the actor itself is an effect of the network. It is as important to uncover those who did not become actors

or only actors in so far as they contribute to the actancy of others. Tracing the actors could favour those who became powerful actors and neglect those who were marginalised in the process. It is therefore important for critical perspectives to listen to the “quiet voices”, the omissions, the absences, and to those whose actancies are used as a resource for others.

In response to the critique of Saldanha (2003:424) Law’s form of critique shows how contradictory and multiple military power is. It shows that the appearance of coherence of the power happens at the cost of many entities that are being silenced. It also shows how the articulation by these silenced entities reveals how related and fragile this power is and to what extent we are fooled by appearances of unity and singularity.

9. Critical research

While Sections 4-8 discussed various ways in which critique makes a different reading of the processes of assembly possible, this section investigates a possible way in which different paradigms in ISR could be related to an ANT approach to critique. It takes a key from Law’s metaphor of the pin board where different narratives are juxtaposed. It takes a similar key from Latour who does not so much denounce the other approaches to critique, but only their belief in a singular basis of critique (see Chapter 6, Subsection 2.4). Critique is possible for Latour (1993:38, 40, 67) when different perspectives are put together. This principle is explored in relation to critical interpretivism of Klein & Myers (1999) and to Hirschheim, Klein & Lyytinen’s (1996) investigation into research paradigms in ISD.

9.1. *Critical interpretivism*

It has been indicated in Chapter 6 (Subsection 5.5) that the strategy of the pin board provides a way to juxtapose multiple subjective narratives in such a way that different and contradictory accounts are provided of the effects of the assembly processes on the identity and associations of entities. This is a critical tool through which problematical aspects of a network could be identified.

An element of the identification and articulation of multiple narratives of those involved in the network is present in the critical interpretivism of Klein & Myers (1999:77) who identify in this article seven principles of interpretive research. The sixth principle of “multiple interpretations” entails the sensitivity of the researcher to a different and conflicting perspective from different participants in the field. Klein & Myers do not recognise the critical potential in multiple perspectives since they locate critique only in their “principle of suspicion” according to which the researcher is alerted to ‘biases’ and systematic ‘distortions’ in the narratives collected from the participants” (*ibid.*, p.72).

What is interesting in the study of Klein & Myers is the way they use the principle of multiple perspectives as a critical tool within the principle of suspicion. When they refer to the case studies which they used throughout the article to illustrate interpretive methods, they relate the suspicion of the researcher to different interpretations of the network. It appears, however, that the different perspectives are strongly selected by the researcher to confirm the suspicion about biases and systematic distortions with the result that only some voices are privileged. This privileging of those voices which support the researcher’s suspicion allocates a stronger role to the researcher than what is the case in ANT. Although the researcher is always in the position to select and articulate the narratives, ANT wishes to suspend the judgement of the researcher in order to multiply the narratives and to make the narratives more visible. The ANT researcher does not simply select other voices in so far as they support his/her critical perspective as appears to be the case with Klein & Myers.

9.2. *Fragmented disciplinary field*

While a form of critique that is based on multiple narratives is present in critical interpretivism, an attempt is made here to show how the account of Hirschheim, Klein & Lyytinen (1996) (see Chapter 3, Subsection 7.6) of the field of Information Systems Development (ISD) could be related to critique. The authors express the wish for the different research paradigms to share the same forum in order to learn from each other. Although they locate critique in only one of the nine possible areas

of study, their view of the research field of ISD as a whole could be related to the notion of multiple narratives. If the field of ISD is seen in a “fractal” (Law, 1999:12) way, then it is “more than one and less than many”. With this notion Law wants to show that any object is a complexity (more than one), but that it cannot be broken up in many fragments (less than two). The same principle could be applied to the field of ISD to show that it is not so much a “fragmented adhocracy”, but that it coheres and that the possibility of critique lies in the coherent diversity. We cannot allow the different object classes, (or areas of research with an own research paradigm) to become fragmented since that will leave them in isolated cubicles with no relevance for each other. By recognising that the system is “less than many”, one is forced to relate the different areas of research to each other. This does not attempt to bring them under the umbrella of the master narrative of one paradigm, but leaves the distinctness of each area. If the contribution of each research area could be juxtaposed with the others, a complex mosaic appears with the potential for critique in the way alternative (conflictual, complementary, different) narratives are given of the same artefact. The simultaneous juxtaposition makes it possible to recognise alternative and opposing claims related to the same artefact.

The possibility of critique should not be relegated to only one of the object classes, but it lies exactly in the relations between the different orientations and domains of research. If critique is limited to only some of the object classes (the communicative and discursive orientations and to the domains of language and organisation), then the relevance of critique for the domain of technology could not be fully developed. Critique is then not present when the “pure technological” operations take place. In opposition to this way of seeing the field, these different paradigms should be assembled in order to achieve critique. The “purely technical” perspective is as important as the communicative human agent. It has to be realised that the “most technical” is also the “most social” (cf. Monteiro & Hanseth, 1996). An understanding of the way the technical agent translates and mediates is as important as understanding similar actions of the human agent. The only way this could be known is by allowing the multiple entities to speak for themselves.

If this interpretation of the critical potential within the field of ISD is valid, then the appeal of the authors that the different paradigms should share the same forum has relevance beyond what they intended. It does not only contribute to a better understanding of the field, but also potentially contribute to a realisation of critique.

10. Conclusion

This chapter provides an account of the critique of technology and investigated different possible ways in which technology could be critiqued from an ANT perspective. It has been shown how some of the strategies of critique that were discussed in Chapter 6 could be applied to the role of technology in networks. It has been indicated that critique should focus on the detailed description of the effects of technology on other entities which is best done when multiple perspectives are brought together. The role of technology in the whole must be carefully traced in order to investigate all the forms of delegation, translation, and inscription.

The critique does not simply label technology as ideological (Pippin, 1995) or as the product of human actions and decisions (constructivism) because technology (as a hybrid entity) plays an important active role in the constitution of the network. Although this role cannot merely be portrayed as negative or problematic, it is potentially dangerous because of its power and invisibility. A critique of technology should articulate the silent voice of technology and it should show what the effect on the whole of processes of network building is. Critique does not aim to destroy the technology because it respects the assembling and reality-building processes. It carefully follows the actant to establish how entities are enrolled and identities shifted. It shows that the effects of these shifts are not the inevitable result of deterministic technologies. Critique is not a simple endorsement or condemnation of technology.

Critique does not assume that humans could distance themselves from technology in order to gain an unmediated perspective as vantage point. We are not placed in a position of control and judgement. As an Other, we have to respect the “irreduction” (Latour, 2004a:73) of technology, the assumption that each entity is totally different

from any other entity. Critique enables us to realise that this other is not the monster it is often made out to be. Technology is not “frozen organisational discourse” because it also makes discourse possible and shifts the meanings in unanticipated ways.

This view of technology shows that society cannot be neatly separated into the human and the technological as a precondition for the critique of technology. The relation/entanglement of the human and the technical is much closer with the result that one cannot simply talk about the “impact of technology” or about controlling technology.

The following chapter concludes the study by elaborating on the main findings that are implicit in this chapter.

Conclusion

1. Introduction

This study wanted to contribute to critical studies of IS by addressing, from an ANT perspective, two areas it regards as problematical in CRIS. It claims that such a perspective has not been fully explored in the literature. The limitation in CRIS relates to the weak theorisation of technology and the limited focus of critique. The weak theorisation of the technological refers to the mainly instrumentalist and constructivist understanding of technology. It is argued that these understandings of the technological limit the focus of critique to the human sphere. The study joins the quest for specificity about technology but does not only focus on what is inscribed into it, but also on the effects of the technological actant. The ANT conception of the technological as an actant in heterogeneous networks opens various new avenues for critique. It has been shown that the process of technologising plays central roles in socio-technical networks and that it has certain effects which contribute to both change and stability. The technological could not be limited to the “purely” technical, but has effects on the typical human functions such as communication, cognition, morality and ends. These effects of technology are of central concern to the critical researcher who wants to contribute towards the morality of the processes of assembling. After investigations into the conceptions of technology and of critique in ANT, some case studies were investigated and reinterpreted in order to show how

such a critique of the socio-technical networks might be done. (The implications of the study for a different understanding of technology, critique, the role of actants in networks and for the role of the researcher are discussed.) Where in most other critical traditions the critical researcher equipped with a theory, has been central in critique, it is indicated here how the roles of the researcher and of theories are different in an ANT approach. In this process the study contributes towards a deepening and broadening of critique. The deepening of critique refers to the need for a critical function within the very processes of assembling. The broadening of critique refers to the participation of all entities in processes of critique.

This chapter consists of an elaboration of the main findings of the study and its contribution to CRIS. This elaboration consists of theoretical aspects such as the conception of critique and of technology and of methodological elements such as the process and strategy of critique.

2. The multiplication of narratives

Since ANT takes the decentredness of humans seriously critique is deprived of a centre in the form of the critical researcher or of a critical theory. An ANT conception of critique does also not include a notion of emancipation. It is argued that notions of emancipation inevitably contain a substantial notion of the self and once such a substantial notion is inscribed into a socio-technical network it becomes black boxed and strongly shapes future uses of technology. Such a notion of the emancipated self is limiting because it denies the ways identity shifts through technical mediation. The attempt to emancipate could therefore prove to be as oppressive as the order it wanted to overthrow.

ANT provides a response to the question how critique is possible without a centre and without a notion of emancipation. The ANT approach to critique differs from modern forms such as critical theory and critical ethnography since it does not claim an epistemological or moral vantage point from where critique could be rendered. ANT moves closer to postmodern forms of critique in its emphasis on multiple perspectives and discursivity. The decentredness of the critical researcher elicits the need for multiple narratives. If critique cannot be rendered from a singular point of view, the points of view have to be multiplied. The difference with the postmodern

approach lies in the way ANT maintains the coherence of the object of critique. While emphasising multiple narratives, it maintains that the object should not be presented as disintegrated and fragmented. This view is necessary to understand why the object could still accumulate and exercise power since it would not be possible to explain how a fragmented object could have dominating effects. To hold the narratives together, it is important to maintain that they deal with the same object. The coherence of the narratives is possible because of the fractal nature of the object (Chapter 4, Subsection 3.2). A necessary condition for critique to be possible is that the narratives have to be focused on a single object. The critique of the (technological) object would not have been possible if the narratives were fragmented because the views from the different subject positions could not have been compared with one another. They would represent different worlds and would deal with totally different objects.

Multiple narratives are needed because any single narrative represents the dominance of a researcher, or of a theory or of a dominant view of the object. Multi-narratives are also needed because of the inherent complexity and irreducibility of the object. The object is multiple and ambiguous because it could be perceived, experienced and evaluated from many different subject positions. These subject positions also do not remain stable once they become entangled with technologies. The ambiguity and multiplicity of the object increase when the shifts in subject positions are effected by the same technology that is being evaluated.

The multiplication of narratives implies that no one could be prioritised above any other and that the singular perspective provided by each one is valuable in itself. The multiplication of narratives shows that attempts to centre the object is exclusionary in that it privileges the interests and voices of some above those of others. Narratives have to be gained from various subject positions, both human and nonhuman. The narratives are extended to technical objects who are also actants or possible actants in the network. The black box of technology is being opened when the technological voice is being articulated.

What each of the narratives brings is the way the irreducibility of the narrator is compromised through various kinds of reductions which are an inherent part of the processes of translation through which a network comes into being (Chapter 4,

Subsection 4.2). It has been indicated that in order for any entity to become part of a network, its interests have to be shifted. The narratives demonstrate how the identity of an entity is shaped or how it could have been shaped differently. This irreducibility of every entity does not correspond to any manifestation of identity. On the contrary, any such identity would already be a reduction because it is produced by the network where interests and goals are shifted.

It could therefore not be said that the subject position at the origin of a narrative represents a truth about the entity or about the network. The morality of the network could not be read off from any particular subject position. The narrative of an actant cannot be taken at face value as representation of a subjective or objective truth. If this were to be the case the multiplication of subjective truths would be meaningless when the validity of one is offset against the validity of the other. This could easily slip into the relativistic acceptance of multiple truths which exclude the opportunities to compare them. The narratives can also not present an objective truth because none of them could claim a privileged epistemological position. The effects of the narratives should not be looked for in the epistemology of truth, but in the ontology of possibilities. Each of the narratives presents the possibility of a different arrangement of the network with different associations and translations of interests. Each one provides a subjective perspective on the effects of assembling processes.

3. Relating narratives

Since the narratives deal with the same actor-network, they have to be related to each other. The metaphor of the pin board (Chapter 6, Subsection 5.5) suggests itself as the most appropriate tool to combine the separateness and relatedness of the narratives. They have to be kept separate because the one cannot be subsumed by another. They have also to be related because one has implications for the other.

As a technology the pin board juxtaposes multiple subject narratives. It does not attempt to sort or hierarchise them since they are merely pinned together as they arise from the researcher's labour. In the process and as a typical process of technical mediation, the seemingly unrelated narratives are "folded" together and "gathered". This process would create real unpredictable effects about the identity of entities and their relations.

When seemingly unrelated and conflictual narratives are folded together the possible implications of the one on the other may become visible to another subjective observer. The pin board creates a discretionary space which enables elements of a network to become visible to such an observer. What might become visible is not intended and could not be predicted by anyone. The hope of the critical researcher is that it may show things such as how the power of the marginalised is tapped from by a powerful actant, or how their identity and goals were shifted through technological mediation. An important possible effect of multiple narratives is that all participants (users, designers, managers) become more aware of the multiple effects of techniques and of the ways these effects change and maintain social relations (hierarchies) and morality.

The process may lead to critical insights, but critique cannot be guaranteed. Critique and transformation do not flow necessarily from this process (as suggested in the linear process of Alvesson & Deetz, 2000). Critique is not the sole privilege of the researcher any more since it becomes democratised. In this democracy of critique all actants could contribute to the pin board and could reflect on the pinning down of the multiple narratives.

The technology of the pin board makes it possible to deepen and broaden critique. The broadening of critique relates to the articulation and presentation of the technological narrative (Chapter 7, Subsection 3) with all the other human narratives. The deepening of the critique relates to the level where the interests and identity of the individual entity is shifted. Since ANT is suspicious of categories and focuses on the irreducibility of each entity, critique makes it possible to trace and evaluate how the interests and identity of each entity shifts through technical mediation. Although this focus on the individual does not ignore larger networks, critique could now become a much more precise enterprise and could be closely related to empirical studies.

4. Critique as care

The notion of critique as care and protection is a novel idea in CRIS. ANT has shown that it is as important to evaluate a network critically as it is to care for the survival of an existing or potential moral order. Critique does not only have the negative task to

uncover deficiencies, but the positive task to protect a certain moral order. This positive task is different from the Habermasian one where the conditions for rational (emancipatory) systems design are proposed. The caring role of critique is in contrast to critical approaches which aim to uncover and destroy without appreciating what has been brought together. The care also relates to projects that have not realised and that might have created a moral order.

Critique involves an appreciation of the technological actant and the good it could achieve (such as a moral order). This appreciation is not limited to the level of effectiveness that is achieved through technology, but it extends the way the social order is composed and maintained. If humans are not as moral as machines (Chapter 5, Subsection 3.3), we need to appreciate what machines do and to what extent society would not be possible without them. The care for the values embodied in technology alerts the critical spirit to what could be lost without the technological artefact such as when a traffic light or a speed bump is not installed in a busy street which school children have to cross. It has been discussed in relation to Latour's account of Aramis, how critique cares for the moral order that did not realise when the project failed (Chapter 7, Section 3). It is important for critique to make a positive contribution to the development and maintenance of these worlds and not just to share in the revolutionary spirit which wants to overthrow and replace.

5. Role of theory

ANT is suspicious of theories because of their ambiguous role in the building of reality. By utilising a critical theory about gender for example, critique contributes to the reality of the world in which the category of gender functions. This does not simply mean that critique contributes to gender discrimination, but that it contributes to the reality of the category gender and the many ways in which this category contributes to the distribution of roles and status. It is not enough for critique to be reflexively aware of the effects of its categories, it has to devise critique in such a way that the categories are avoided.

The exclusion of a guiding theory does not mean that such theories may not be incorporated in an ANT approach to critique. In contrast to this sentiment in ANT, it could be argued that a theory of bureaucracy plays a guiding role in the case study

of the tertiary institution (Chapter 7, Section 7), or a theory of gender bias in the case study of the NIC (Chapter 7, Section 5). The important point of ANT is that these general theories cannot simply be applied in a particular situation and that the particular situation is not an instance of the theory. ANT states that the generalising claims of theory violates the “irreducibility” of the individual.

A weaker role of theory is present in Walsham (2001) who uses it as a sensitising device. In his case he used theories of globalisation and the risk society in analysing the geographic information systems (GIS) in India. In a similar way a theory of gender could sensitise the researcher to marginalised voices that need to be added to the pin board. In this sense theories could prove to be very important to enable the researcher to look for particular nuances in the narrative. These then do not become “cases” of gender discrimination since that would essentialise a gender identity.

This conception of the role of theory in critical research could be seen as a corrective to the aversion to theory in ANT. While Latour (Chapter 4, Subsection 2.1) claims that the perceived need for theory is an indication that the actants haven't been followed adequately, theories could open the eye of the researcher to identify and select possible marginalised voices. In response to the accusation that theories provide a short cut to the researcher, it could be stated that such short cuts are inevitable if research is to have any meaning to actants in networks. The short cut of theory does not make the researcher jump to a conclusive judgement of the wrongs of a certain order, but it enables the researcher to select appropriately. A theory of technological determinism, for example, may sensitise the researcher to the voice of some technologies that may treat everything as a resource (Heidegger), or other technologies may present themselves as innocent instruments in the hands of others.

6. Critical researcher

It has been indicated that the role of the researcher is always problematic in critical research (see Chapter 6 Subsection 5.1). This role is also an issue in ANT where research is not only of an analytical but also of a performative nature in the sense that the text of the researcher is an actant which could affect the network in unpredictable ways. It is therefore important to generate the right kind of text (see

Chapter 3 Subsection 2.4) which does not prescribe but opens up possibilities for different actions. A kind of critique which accepts the consequences of the decentred human, cannot put the critical agent on the centre stage as the one with the insight into the wrongs and the rights. Critique has to open a space for discretionary and alternative action.

The critical responsibility of the researcher consists for ANT in his/her role to find and articulate narratives from all those involved in the constitution of the object/network in order to make possible the multi-narrative strategy of critique. The ANT researcher then presents the actants in the network with the pin board that would allow them to provide their own narrative and to see the narratives of others. In this way the researcher demonstrates the fragility of the network, the ways and extent to which interests, identities and ends are shifted and the way the powerful achieve and maintain their positions. The focus on the technological actant shows the ways in which technology contributes to these outcomes. Humans become particularly aware of how they (interests, intentions, ends, morality) are produced by their association with technology and by the way they became hybrid entities.

It could be argued that ANT provides a very weak notion of critique if it is left to those inside the network to liberate themselves and if the researcher plays a relatively marginal role. It could be questioned, on the other hand, how effective in the long run external forms of critique are. Could liberation really come from the outside without the participation of the insiders, or does it result in the imposition of an external conception of liberation? If liberation has to involve the insiders, what exactly is the relation between them and the critical researcher? It seems at least that these issues are not fully clarified in critical traditions and that the critique of an inadequate position rests on own positions which do not clarify these questions. It must also be acknowledged that the boundaries between the inside and the outside shift continuously and that the critical researcher with his/her principle of selection, becomes inevitably part of the inside through his/her questions, comments, reports, selections, etc.

The critical researcher is not the one with the final judgement or best suspicion based on a theoretical perspective. The critical researcher can also not be the passive recorder of the many narratives in a network. In an ANT view, the critical

researcher interested in technology is actively busy to find, select and generate subject narratives that would open up the processes of translation and technical mediation. The sensitising role of theory highlights the active role of the critical researcher who is made aware of possible marginalised voices. This is, however, a different kind of activeness than the emancipatory designer or the researcher with a critical theorem. The researcher is actively looking for narratives to include on the pin board. Although the researcher may be sensitised by theories, this process can never end because of the infinite ways in which one entity is being reduced to another. The critical researcher attempts to capture such reductions wherever they occur.

Although the role of the critical researcher is problematic, ANT emphasises the essential role of this researcher as the one that has to select, prioritise and present the narratives. In this process the prejudices and intentions of the researcher will inevitably play a role. The researcher does, however, not present an own narrative, but has to take a back seat in order to enable the voices to be heard.

7. Empirical critical research

The study contributes to the growing trend in CRIS to generate empirical studies. This focus on the empirical is not the same as the empiricism of ethnographic studies where the “insider’s account” is taken at face value. Since a social order is deeply engrained in socio-technical networks, a careful unpacking of inscriptions and the following of prescriptions are necessary. This could only be done through a certain kind of empirical research. This is not the kind of research which merely records the views of insiders, or the characteristics of entities. It is research which traces the translations and articulates the marginalised voices. The research probes for hidden translations and forms of reduction. It looks actively for the silent and silenced voices including the silent voice of technology.

These processes cannot be described from a single position but could only be done by those whose identities are being reduced. Real insight into this reduction can only be displayed by the “ordinary” actant. The multiplication of these insights provides a fuller picture of the powerful processes of assembly. It is not merely the multiplication

of all insights, but rather the careful selection of subject positions and of the kinds of narratives that are being told.

The attentiveness to the many ways in which actants in a network experience forms of reduction represents the way in which ANT deepens critique. Critique is not a generalised account of “gender discrimination”, or “worker alienation”, but it hones in on the way any individual entity is reduced to another. This reduction might even happen in cases where an entity is classified as part of “the oppressed”, or as “alienated” from the products of their labour. It is only through its close attentiveness to the accounts of actants in the network that critique could become effective.

8. The agent of critique and transformation

The question may be asked what is the point of critique that always comes too late. A critical analysis is usually done of events that already took place and about which not much could be done. The perception that critique takes place after the network has already been established is strengthened by the way the case studies are discussed in Chapter 7. It is important to realise, however, that although this discussion relates to events in the past, it is relevant for the processes of networking that take place all the time.

The point of ANT’s approach to critique is that those involved have to be aware of the problematic processes of the network-building. We have to be aware of ways in which interests are translated, identities shifted, betrayal happens - while it is taking place. The building of the network is always and everywhere taking place. It has been discussed in Chapter 4 (Subsection 2.1) that networks and reality are continually being performed in the present and that one does not have to go back into the past to understand where the network comes from. Even though some elements originated in the past, their persistence in the presence must be attributed to the current processes of translation and association. The present cannot be explained with reference to the momentum of past events. This is also the case with associations that are entrenched in technologies. Technology’s persistent effect in the present in a particular context cannot be explained with reference to technology’s black boxing in the past or the way it is designed in a different context. The very associations that made the black box effective elsewhere, have to be functioning in

the network under investigation. This same principle is present in ANT's translation model of power (Chapter 4, Subsection 4.3) according to which the powerful needs the cooperation of the present assembly to maintain its position. The origin of the social order is in the present and the social is always in the process of making and remaking.

ANT provides therefore the means through which every actant becomes better informed of these process of network building and of its own implicatedness in it. Every actant should be fully aware of the processes of translation and of the role of technology. Critical research should enable such an informed actant to participate in a different way in the processes of assembly. An actant that understands Callon's processes of translation (problematization, *interessement*, hierarchisation and mobilisation) (Chapter 6, Section 7) would be much more aware of processes through which his/her interests are shifted in the service of others. The unpredictability of our network-building actions relates to the mingling with technical objects whose mediation of our interests drifts in unknown ways. This calls for continual vigilance of the possible and real effects of networking, of enrolling technical objects and trusting them with our hopes.

When critique enables every actant s/he is more informed in the processes of network building. An actant who is aware of the subtle processes of mediation and translation would be alerted in the presence of technologies which silently shift and organise. This silent work is not represented in the explicit design plans or in visions of technological innovation, but does its own work regardless of the verbal messages that fly around. The "ordinary" actant should become aware of the ways in which technology shifts his/her identity, interests and goals. Some of these shifts may be acceptable, while others are not. In either case the actant is in a position to detect and evaluate the shifts. On the basis of the realisation that every actant is "irreducible" s/he should be sensitised to the always occurring processes of reduction.

These insights are not only of a rational nature, but incorporates the bodily, material locatedness in a network (Law, 2002:49, 50). The material effects of technology is not only cognitively recognised, but also bodily experienced. The materiality of

technological artefacts are experienced by the body even before it is grasped cognitively.

This insight of the actant in the processes of heterogeneous network building, enables critique and transformation (Alvesson & Deetz, 2000). Through the juxtaposition of subjective narratives and the permeability of the network that transpires the actant does not only gain insight, but could also evaluate to what extent interests are translated. The insight, that the qualitative differences that exist between the powerful and the weak is a result of quantitative differences (Chapter 4, Subsection 2.3), involves an important mind shift for the weak who might have thought that their lack of power is the result of an inner weakness. ANT provides the means to carefully trace exactly how the strong obtain and maintain their position. The realisation that the power of the strong ones is dependent on the active and willing contribution of the weak ones, is a second important mind shift for the transformatory actant in the network.

The possibility of transformation of technology lies in the possibilities and options that opens up for the insiders through the technology of the pin board to follow transformatory strategies such as a different association or the resistance of a particular translation of interests.

9. Conception of technology

Although the role of technology as an actant has been argued throughout the study and does not need to be stated again in detail, it should be emphasised as one of the findings. Once instrumentalist, substantialist and constructivist views of technology are left behind, the role of technology in the constitution of networks could be recognised. Any particular technology is a complex entity which brings a number and a variety of entities together in a more or less coherent whole when successful. The number and variety are increased with modern technologies which include human bodies, ideas, purposes, material objects, natural forces, norms and ideals. In order to achieve success, the nature of the enrolled entities had to be changed. Once this new configuration has been achieved a seemingly closed network is the result.

The study shows that technology is not the monster it is often portrayed to be since it contributes to the meaning of humanity. It also shows how far human responsibility stretches in its encounter with technologies. It aims to contribute to an understanding of the nature of human responsibility, consciousness and reflexive awareness by showing how these functions are already mediated through technological means. It provides a way to develop a deeper understanding of the ways and extent of the enabling/constraining conceptions of the role of technology. The question is not so much whether technology enables or constrains human action, but rather what kinds of human actions are made possible or impossible through the association with technologies. Not everything which we do or which we are prevented from doing through technology could be regarded as empowering or disempowering, respectively.

An ANT approach to technology makes it possible to relate the very technical and the very social elements of hybrid networks. The question is asked in the ISD literature about the relation between the features and effects of technology (Chapter 3, Section 6) and it is often described in terms of “interpretive flexibility”. Since ANT extends the meaning of the social to include the relations between the “purely technical” and since ANT does not make a qualitative difference between the human and the technical, the implications of the social relations within the detail of “technical” design for the composition of the hybrid network, and therefore also for the human relations, could be traced. This is to some extent demonstrated in the case studies in Chapter 7 such as when the technical details of the patient forms inscribe the identity of the patients (Section 4), or when the technological infrastructure of the NIC prescribes the professionalism of nurses (Section 5). The reinterpretation of the way the terrain of ISR has been mapped by Hirschheim & Klein (Chapter 7, Subsection 9.2) opens the possibilities to juxtapose the very “technical” design features and the “social” effects. Since the most technical is also the most social (cf. Monteiro & Hanseth, 1996), it has to be established how social features are inscribed in the technical detail such as the structure of a database, or the way ontology of objects are defined (Smith, 2003). One should be able to narrate the technological voice which represents how the nature and relations between entities are defined. Information Systems Ontology does not just describe existing objects, but shifts their identities in subtle ways and creates new relations between

these objects. The characteristics of these entities are inscribed in the very technical detail.

To say that the most technical is the most social, entails that social relations exist between all the “technical” entities and that the social relations between the “technical” entities impact on the social relations between humans since the latter is continually being mediated by the former. The difference between the “most” technical and the “most” human cannot be decided beforehand since the human is already defined within the “most” technical, as is the case with the NIC, or the patient forms.

10. Critique of technology

Our view of technology is ambiguous and in many ways wrong. On the one hand and most of the time we are unaware of the actions and effects of technology. We do not realise to what extent human nature and society are already affected by technological artefacts while we live in full harmony with all these silent workers. We are blinded by the ideology of pure humanity which denies the pervasive roles of technologies. This desire to keep humanity pure is expressed in concepts such as “cognition”, “choice”, “freedom” and “autonomy” which is kept separate from technological artefacts. The idea that any of these human functions are affected by technology is unthinkable. We are also blinded because we do not see the silent and unobtrusive ways in which technology functions. It is only when technology breaks down that we realise to what extent we have become dependent on the silent workers. The blindness promotes the free intermingling of humans and technologies in a seemingly harmonious hybridity. Since we are not aware of the roles of the invisible technologies, we do not think twice when they are proliferated and introduced in our lives. This blindness also promotes the multiplication of technologies and its extension into more typically human terrains. Sometimes we become acutely aware of the technological artefacts and are alerted to the ways in which “our” world is invaded by these alien entities and how the “human” way of life is threatened.

The lines of the ambiguous attitude towards technology are not fixed. It is never quite clear at what point or for what reasons the switch is made from the oblivious comfort

of convenient technologies to the grave concern that our humanity is being threatened in some way. Such a clear switch is visible when technology is perceived to take over our jobs, or when it appears to deskill us such as when technology undermines education. We are quick to speak of “too much” technology that invades our life world. It also happens when technology breaks down and we become aware of how dependent we have become and wonder what is left of our true humanity. Such an awareness triggers the critical spirit which raises questions such as: What is technology doing to us?, or What is left of our humanity? The critique is also triggered by a fear of technology and raises at times the fearful spectacle of a monster of Armageddon.

The problem with these kinds of critique is that they come on the scene too late and unprepared. In an ontological sense they do not realise to what extent our lives have been shaped by technologies. In a temporal sense the critical spirit hasn't been present while the transactions took place between humans and technologies through which competence, responsibilities, opportunities and values were interchanged and distributed. The belated critique realises too late what has been happening all the time and is confronted with what appears to be a *fait accompli*. What is more is that the critique does not realise in which ways itself is already made possible by technologies.

If technology does not operate on its own and does not determine any particular outcome, the question could be asked why the separate interest in the critique of technology? If everything are hybrids, why distinguish one from the other and allocate special attention to one entity? One part of the answer is that the principle of symmetry does not imply equivalence and that the aim of ANT is to trace how differences are generated.

Another part of the answer is to indicate that the focus of critique is not so much the technological artefact as such, but the processes of technologising, or technological mediation brought about by the technological artefact within heterogeneous networks. This study indicated that the technological artefact could not be the object of critique as such, but that the focus should rather be on the processes of technologising. These processes of technologising cannot be seen in isolation, but only as part of the larger heterogeneous composition of networks. Technological

effects are network effects. What exactly these effects are depend on the particular network and could only be established from the point of view of the individual actant that is effected. While technologising entails folding, gathering, translating and assembling, the inscription of these processes in material entities brings durability and irreversibility. The outcomes of these processes are not determined by the artefact, but are the contingent effects of the network. These processes do not determine particular substantive effects, but order and change the network within which it operates. The exact effects of technological mediation could only be established through tracing of the actants. The critique of technology is thus a critique of the processes and outcomes of technological mediation in a network. The attention to technology does not isolate from the network as such, but looks in particular at the technological processes.

The study has therefore shown that the critique of technology could not be a field on its own and that critique should focus on the heterogeneous network as a whole. In the critical evaluation of the network one could focus attention on particular elements such as the technological actant in the heterogeneous network. The ANT approach to the critique of technology is inseparable from its unique way of analysing networks. Critique enters the analytical and descriptive task as evaluative moments.

11. A critical reflection on ANT

An important focus of this study was to provide an interpretation of ANT by drawing on a combination of key texts. It considered various critical perspectives on ANT and showed largely to what extent they were based on limited or wrong understandings. It emphasises the need to understand ANT in a holistic way and not to isolate particular elements as the focus of critique. The orientation in this study was not so much to identify possible gaps in the network of ANT, but to think along the basic principles and methods in order to draw out the implications for a critical view of technology. It was thought to be counterproductive to focus on possible flaws in the body of literature that makes up ANT since the meaning and implications of the basic principles are still being developed and extended to new terrains. ANT could also not be seen as an orthodoxy since it acknowledges continual translation of the basic

principles and accepts the risk that a clear boundary could not be drawn between translation and betrayal (Law, 1997).

This critical reflection on ANT aims to contribute to this translation and focuses on two elements. The first relates to the problematical aspects of ANT's view of theory that has already been discussed (Section 4 above). The second element relates to the tendency to use ANT for managerialist purposes (discussed throughout the study, but particularly in Chapter 2, Section 1 and Subsections 2.1 and 2.3; Chapter 7, Section 6). The possibility to use ANT in this way is not an unfaithful translation since the elements are present in ANT to provide dominating actants with strategic tools to problematise, interest, enrol and mobilise masses of entities in their own networks. ANT also provides the technological means to seal these enrolments and fixate the identities of others. ANT provides the insight for these actants to inscribe their processes into the material durability of technologies.

In order for ANT to recognise such a translation as a betrayal, it has to understand itself as a tool of critique. It is argued that although such a critical approach flows consistently from the main beliefs and methods of ANT, it has not been made adequately explicit in ANT studies. This study indicated how it is possible for ANT to develop a critique of technology, or rather of any socio-technical network. The future development of ANT is dependent on its ability to take on a critical approach such as the one developed here which would prevent it from being hijacked for managerial purposes.

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