

Geographies of eHealth

Studies of Healthcare at a Distance

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DEPARTMENT OF SOCIOLOGY AND WORK SCIENCE

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Abstract

This thesis examines the proliferation of healthcare services using information and communication technology to overcome spatial and temporal obstacles. These services are given such names as telemedicine and telecare, which are sometimes grouped together as telehealthcare under the umbrella term eHealth.

My main argument is that a prevalent and overoptimistic rhetoric of how the possibilities of digitalization are expected to produce a homogenous and ubiquitous healthcare space conceals many of the spatiotemporal complexities involved in introducing telehealthcare and in the overall organizing of healthcare. To counteract such simplifications, I contend that we need a relational understanding of the technical and the geographical as always nested in the social and vice versa. With such an approach, it is arguably possible to begin to tease apart the many spatiotemporal entanglements of these innovations and to trace their political ramifications. This position is developed by integrating perspectives from science and technology studies with insights from human geography. The four constituent papers of this thesis pursue this argument in qualitatively grounded case studies of telehealthcare and its geographies.

Paper I looks at various initiatives for fetal tele-ultrasonography, demonstrating that this practice cannot be reduced to a mere transparent relay for the speedy transmission of digital information across space and time. The paper investigates how its introduction could affect medical knowledge production, power hierarchies, and subject positions, for example, the status attributed to the fetal figure.

Paper II traces Swedish transformations of telehealthcare. The use of telemedicine to reach those outside medicine's range has arguably been accompanied by efforts to achieve intra-organizational streamlining via telemedicine. This process has continued with the emergence of telecare for personal use directed toward the overlapping groups of the elderly people and patients with chronic conditions. I contend that this shift can be understood through a geographical lens as attempts to save space and time by keeping as many patients as possible out of costly hospitalization and preventing them from engaging scarce specialist resources.

Paper III compares four telemedicine projects in Sweden. In detailing how the purpose of practicing telemedicine differed between these projects in relation to, for example, the specifics of distance, care availability, and treated medical conditions, the paper demonstrates the existence of many versions of telemedicine. Whereas this fluidity could further the spread of telemedi-

cine, it could also cause problems. To various actors wanting to use telemedicine in a homogenous and fixed way for national streamlining purposes, this diversity has generated confusion when they wished to align telemedicine in a preferred direction. The paper concludes that technology travels best when it can contain both fluid and fixed relationships.

Paper IV argues that, whatever is claimed about creating a space- and time-independent healthcare by means of telehealthcare, the use of telecare to connect the standardized spaces of healthcare with the fluid everyday lives of elderly people and patients with chronic conditions actually works by unfolding new spaces of visibility and establishing new temporalities as well. By investigating these spatiotemporalities, I demonstrate that these applications draw together discourses on individual freedom with medically derived algorithms and concerns about how to make best use of scarce healthcare resources.

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Paper I

Petersson, J. and Landzelius, K. (2014) (Re)Producing the Fetal Patient: Tele-ultrasonography and the Constitution of Obstetrical Knowledges. Manuscript submitted.

Paper II

Petersson, J. (2012) From Medicine by Wire to Governing Wireless: Changing Geographies of Healthcare. In B. Larsson, M. Letell, and H. Törn (Eds.), *Transformations of the Swedish Welfare State*, pp. 153-167. Basingstoke: Palgrave Macmillan.

Paper III

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Paper IV

Petersson, J. (2014) Redesigning (Tele)Healthcare: Unfolding New Spaces of Visibility. Manuscript submitted.

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1

Introductory Remarks

This thesis addresses the seemingly constant increase in the use of information and communication technology (ICT) in the healthcare sector, where continuous efforts are made to increase the accessibility, quality, and efficiency of the services provided. Specifically, it concerns itself with the use of ICT to allow provision of a set of healthcare services given such names as telemedicine and telecare, sometimes brought together under the label telehealthcare, which, in turn, is frequently placed under the umbrella term eHealth. Understood as part of an envisioned improved organization of healthcare, as well as comprising the very devices used to set it in place, these innovations exemplify attempts to connect present healthcare systems (often claimed to be in crisis) with an ICT-based brighter future.

Though the connection to other spaces and times is more than a discursive act of using the future to describe the present, the advocates of these technologies often believe it is their very essence—that is, the possibilities such innovations afford to transcend space and time. As is given away by the use of the prefix *tele*—at a distance—telehealthcare is involved in introducing ICT-based healthcare services to overcome spatial and temporal obstacles through processes of digitalization and virtualization. Telehealthcare denotes the potential of connecting electronically sites which are physically set apart, such as hospitals and primary care centers, but also increasingly refers to the linking of healthcare facilities with health management in individuals' living environments, for example, their homes. As such, telehealthcare has brought with it promises of a new geography of healthcare.

This thesis offers an analysis of the many materializations and manifestations of these discourses by empirically investigating various usages of telehealthcare. The examples are wide-ranging: from cross-planetary applications of telemedicine for fetal investigations; the use of telehealthcare to govern healthcare professionals, patients, and the elderly; difficulties encountered in

introducing these innovations to reorganize national healthcare systems; and how these innovations are supposed to be used in citizens' everyday lives.

Due to the strong associations between these innovations and spatiotemporal relationships, this thesis adopts a geographical perspective which neither understands the spatiotemporal dimension as a neutral backdrop for action, nor assumes that ICT has the inherent property of neutralizing geographical barriers. Building on theories developed in the academic field of science and technology studies (STS) combined with insights from human geography, this thesis proposes that the introduction of these services be understood in a relational manner as the interweaving of sociotechnical assemblages with spatiotemporal formations. Instead of regarding these innovations as containing inherent properties, I contend that they come about as the continuous weaving together of a heterogeneous set of entities, human as well as nonhuman, spatial as well as temporal. Dissecting the way these new and emerging geographies of healthcare are relationally constituted allows me to identify different power relations and the diverging interests they encompass.

In section 2, I will begin to map out the geographical imaginations circulating within much eHealth policy in connection with ICT and telehealthcare innovations and the depictions of their revolutionary potential to improve healthcare and its organization. High expectations abound, but the section ends by revealing how, to the frustration of the actors involved, expectations have barely been fulfilled. Furthermore, social scientists have criticized much ICT policy for being techno-deterministic and simplistic in its belief in the revolutionary geographical positives that will be brought about through the impact of new technology.

In section 3, I set out to characterize theoretical perspectives developed in the field of STS concerning how understanding the role of technology can help us avoid the trap of technological determinism. A relational understanding of technology as always also social is delineated and favored as an alternative to "technological impact" representations of technology as carrying inherent properties somehow implemented in society from the outside.

In section 4, STS theories are translated into the study of telehealthcare. By accounting for previous STS-inspired research into telehealthcare and the use of ICT in healthcare and by scrutinizing empirical cases, I illustrate why there is nothing simple about introducing telehealthcare innovations. The section presents some of the many ways telehealthcare innovations reorder the roles and relations between humans and non-humans in complex and often unforeseen ways.

INTRODUCTORY REMARKS

Section 5 focuses on the geographical positions taken with respect to eHealth and telehealthcare. Various geographical positions are described in relation to previous social science research into telehealthcare and adjacent areas. Once again, technological determinism, as manifested in the belief that ICT by some inherent property will make it possible to de-spatialize healthcare by virtualization, is rejected. First, I illustrate how the virtual cannot be separated from the social and, similarly, how space, time, and distance are neither dimensions outside of society nor neutral. Second, I argue in favor of a relational understanding of space, distance, and time as always interwoven with the heterogeneous assemblages of human and non-human entities, as outlined by STS.

Section 6 summarizes the theoretical underpinnings of the thesis, recapitulating the most important concepts and some of their implications for understanding the introduction and effects of telehealthcare services. In this section I also specify the aim of the thesis and the research questions that have guided it.

Section 7 attends to methodological issues and the fact that the empirical material used is drawn entirely from published textual accounts, and not, for example, from participation, observation, and interviews—means of data gathering characteristic of the ethnographic approach. I further discuss how telehealthcare can be understood in terms of a landscape and how to go about charting this emerging and heterogeneous territory. My comparative approach, contrasting versions of telehealthcare with each other, is outlined and I explain why it constitutes a productive strategy.

Section 8 describes in detail the manner in which I have gathered, used, and analyzed empirical data, and provides concrete examples of the process.

Summaries of the four constituent papers of the thesis are provided in section 9, presenting their most important findings.

Section 10, finally, offers some conclusions.

2

Policy discourses of the Geographies of eHealth and Telehealthcare

The transformation of information into digital formats for collection, transmission, communication, aggregation, storage, and calculation by means of computer power is currently being promoted as central to ambitions to improve healthcare for the benefit of healthcare organizations, patients, and citizens more generally. In an effort to capture and situate these developments within a common frame of reference, a plethora of terms has been suggested, such as “information technology within healthcare,” “health information technology,” and “electronic health information”—to mention just a few. The term eHealth, however, is probably the fastest spreading label used for initiatives integrating ICT and healthcare; for example, it has been adopted by the World Health Organization (WHO) and the European Union (EU). The WHO has defined it broadly as “quite simply, the use of information and communication technology for health” (2006: 1; see also 2011a: vi). The WHO approved its first resolution on eHealth in 2005 (WHO, 2005), which resulted in the establishment of its Global Observatory for eHealth (GOe), set up to monitor and survey eHealth developments. The EU, through its executive body the European Commission (EC), adopted its first eHealth action plan in 2004, describing it as the outcome of billions of Euros in investments in R&D activities since the early 1990s (EC, 2004).

The geographical vocabulary of a new emerging “landscape” has been used within both the WHO and the EU to describe the ongoing development of eHealth and its proclaimed potential to substantially transform healthcare (EC, 2006, 2012a; WHO, 2006: 3, 2011b: 6). However, while both are strongly committed to eHealth, the EU and the WHO can also serve as cases for a brief comparison of how differences in scope are reflected in the parts of eHealth that need to be emphasized when mapping the new (e)healthcare landscape.

To the WHO, with its global commitment to universal “health for all” and working to close the gap between developing and developed nations in the provision of healthcare, eHealth has become a means to redraw the geography of care in endeavoring to reach out to remote communities and vulnerable groups (WHO, 2005). In the context of underserved populations lacking access to medical expertise, the GOe has proposed telemedicine, involving “the delivery of health services using ICT, specifically where distance is a barrier to health care” (WHO, 2011a: vii), as particularly useful. Described as the delivery of medical care through a combination of computers, telecommunication, video-conferencing, and real-time data transfer, telemedicine has been promoted as creating completely new possibilities for people in remote areas to mobilize medical information and expertise otherwise absent (WHO, 2006: 2).

Although telemedicine is frequently associated with delivering healthcare at a distance to remote communities in developing countries, this is by no means its only application. Whereas developing nations struggle to introduce telemedicine in an effort to deliver sometimes the most basic care services, the situation is very different in high- and upper-middle-income countries. As a GOe report on telemedicine explains, in these already healthcare-dense environments, the focus in exploiting telemedicine is instead on its effects on cost-effectiveness, clinical utility, and management issues concerning the best use of human resources (WHO, 2010: 79). This shift in emphasis within telemedicine, from providing remote access to care to those outside the reach of medical care to organizational streamlining and clinical relevance, takes us into another manifestation of the geography embedded in eHealth, which is highly visible in the documents on eHealth produced by the EU administration.

Whereas, for example, the EC (2008: 2) has indeed acknowledged the importance of reaching remote populations, it has unequivocally also stressed the need for telemedicine, and eHealth more generally, to assist in tackling new challenges facing EU members due to experienced changes in the healthcare sector. In the 2004 action plan on eHealth (EC, 2004: 8–9), the Commission declared that eHealth had a major role to play in making the health sector more productive, doing more with fewer resources, and thereby helping resolve the dilemma experienced by healthcare organizations simultaneously facing increasing budgetary pressure and rising patient expectations. Following this line of argument, the European Commission eHealth Task Force Report (EC, 2012a) made it clear that, while their health systems have been the pride of EU democracies, the sector is today stuck in a mid-twentieth-century mode of operation focused on acute intervention in expen-

sive institutions where power resides in service providers rather than users. In this context, eHealth has been advocated by the Commission as a revolutionary approach to promoting health and predicting and treating illness that should make it possible to shift care to primary and preventive levels, with expectations of both lowering costs and achieving a more citizen-centered healthcare (EC, 2007a: 9). To the eHealth Task force (2012a), an important part of making this “paradigm shift” possible is described as moving from what is claimed to be the inefficient storage of health data in silos toward interoperable digital data exchange between different levels of care, making information retrievable from “anywhere” and “everywhere” across Europe. Consequently, a “seamless” and more efficient integration of healthcare services should be expected, opening up new possibilities for healthcare delivery and management that challenge established patterns and divisions. As a GOe report (WHO, 2012: 46) explains concerning the spatial dimensions involved, enabling information sharing is as much about overcoming institutional boundaries as regional ones, pointing to how the one-to-one relationship between patient and doctor is increasingly replaced by parallel collaborative processes that might be both virtual and remote.

However, ongoing attempts to shift care from hospitals to lower levels and the emphasis on citizen-centered, personalized healthcare, moving from acute interventions to taking preventive precautions, necessitate the exploration of another spatial shift. Sustained efforts are accordingly being made to move care delivery from traditional institutional facilities and into individuals’ home environments, infusing the above “anywhere” and “everywhere” proclamations with another set of connotations.

This is especially so in the case of the growing elderly population and the increasing number of citizens diagnosed with chronic conditions (in itself an effect of technomedical success) that have been singled out as demanding special attention. In the case of eHealth, such arrangements include what has come to be called “home monitoring”—or “telecare,” as it was labeled in EU’s 2004 eHealth action plan (EC, 2004: 20). Telecare involves continuous personal health management and lifestyle monitoring linking healthcare facilities and the home environment by means of various wired, wireless, and online solutions for capturing and analyzing health-related information. Introducing computerized management systems that should enable data processing on a scale exceeding the capacity of the human mind is expected to afford new possibilities for spotting changes in individual health conditions, enabling a shift from acute medical interventions toward new predictive practices (EC, 2010a).

Though the elderly and patients with chronic conditions often overlap, it is possible to discern some differences in approaches to them in terms of what citizen-centeredness should denote. In the case of the elderly, “independent living” is frequently invoked to emphasize the importance of helping older people to continue to live in their homes, avoiding/delaying institutionalization with the claimed benefits of both supporting them in their familiar environments and reducing government expenditures. For example, in the EC’s Digital Agenda for delivering economic and social benefits via digital technology, adopted in 2010, allowing older people to live independently and actively was one aspect to be addressed by new innovations in ICT (EC, 2010b: 30). The development of “smart homes for independent living” is one of these efforts and was supported by the EC in its action plan for ICT and Ageing (EC, 2007b: 6). Smart homes belong to an approach that electronically links professionals with the home environments of the elderly through, for example, the incorporation of various safety systems, daily living support solutions, and fall-prevention arrangements (EC, 2010c: 41).

In the case of chronic-care patients, the benefits of independent living are commonly replaced by what is referred to as “patient empowerment.” Like the concept of independent living, it is an approach often advocated as working to the advantage of both patients and the healthcare system. In policy language, it frequently denotes encouraging patients to become more educated about their condition and thus able to take a greater role in handling and managing themselves. In the words of the eHealth Task Force (EC, 2012a), “patients will be empowered to actively participate in managing their own health.” In this context, telemonitoring has been promoted as especially suitable for managing chronic conditions such as chronic heart failure and diabetes. It can, for example, involve having patients collect daily weight and blood sugar data, entering them into a web-based tool for further transmission, processing, and sharing with health professionals (EC, 2008: 4). By involving patients in measurement practices and data gathering, healthcare staff are given new abilities to oversee patients. These initiatives are expected to result in improved lifestyle patterns and health status maintenance (EC, 2006).

Overall, not only is telecare being cast as helping professionals keep a distant eye on monitored individuals, their health, and whereabouts, it is also expected to help prevent costly medical interventions as well as unnecessary and burdensome medical visits to traditional healthcare facilities to the point that “trips to the doctor’s may be the exception, rather than the rule” (EC, 2010a).

However, with the new possibilities afforded by developments in mobile communications, eHealth initiatives aiming to shift healthcare delivery outside its traditional confines are increasingly also attempting to monitor and track individuals on the move, something that, for example, the WHO has referred to as mobile health—mHealth. A GOe survey report (WHO, 2011a: vii) describes mHealth as “a term for medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices.” mHealth has become of great interest to both the EU and the WHO, though their approaches to it differ in line with what we saw in the case of telemedicine. As a GOe report on mHealth (WHO, 2011b) notes, cellular network penetration and mobile phone use are on track to surpass both paved roads and the electricity grid as key innovations in developing nations, giving people unprecedented abilities to communicate over vast geographical distances, including about health matters. Thus, the GOe report concludes that mHealth “can revolutionize health outcomes, providing virtually anyone with a mobile phone with medical expertise and knowledge in real-time” (WHO, 2011b: 77).

Within the EU, however, the innovation of so-called ubiquitous and wearable devices for information gathering outside healthcare enclosures is not particularly geared toward marginalized and remote populations, although this possibility is recognized. Instead, efforts are mainly aligned with the political aims driving home monitoring, i.e., shifting as much healthcare delivery as possible outside the traditional institutions. Beyond apps for mobile phones, activities also include experimentation with vital sign monitoring integrated into clothing and the use of embedded sensors to collect health data, tracking, for example, movement patterns (EC, 2010a). The European eHealth Task Force Report (EC, 2012a) has described these developments as providing “unique opportunities to monitor health in real time in real life situations”. Perceived as overcoming yet another, and perhaps final, spatial boundary, the possibilities of offering care wherever one might be by means of electronic lifestyle and health management has been described as “follow me” healthcare (EC, 2006).

The WHO/EU eHealth policy constitutes rhetoric loaded with references to space and time. By means of technical innovations, healthcare is to be provided “at a distance,” “anywhere,” and “everywhere,” even following citizens wherever they go. Accordingly, there is great promise that these innovations, by reordering the geography of healthcare, will result in more equal, increasingly effective, and higher quality healthcare, launching

healthcare systems into an ICT-based brighter future to the expected benefit of elderly people, patients, professionals, publics, and policymakers.

However, policy circles increasingly realize that there is nothing simple about setting in place innovations for the digitalization of healthcare. As the 2012 EC's eHealth action plan (EC, 2012b: 3) states in its opening lines, the promise of using ICT in healthcare to increase efficiency and improve quality "remains largely unfulfilled." Despondent comparisons are often made between the disappointing situation in healthcare and the success of ICT in other arenas. The GOe report on mHealth (2011b: 75) concludes that whereas mobile technology is said to have revolutionized many areas of society and is successfully used in such domains as online education and mobile banking services, the health sector lags behind in such developments. Similarly, the former U.S. Secretary of Health and Human Services, Tommy Thompson, has been quoted saying that "grocery stores are more automated than the doctor's offices," a situation its citers describe as shocking (Finn and Bria, 2009: 5). Likewise, Estonian president Toomas Hendrik Ilves, chairing the EU Task force on eHealth, wrote in the foreword of its newly released report (EC, 2012a): "We know that in healthcare we lag at least 10 years behind virtually every other area in the implementation of IT solutions," though he is still very confident that ICT will make it possible to revolutionize and radically improve the healthcare sector.

Furthermore, beyond the obstacles encountered in setting eHealth in place, social scientists have been highly critical of the kind of revolutionary rhetoric associated with ICT, which frequently celebrates the spatiotemporal positives to be released once ICT-based innovations are up and running—in line with popular references to "the death of distance" at the hands of ICT (Cairncross, 1997). Discussion of "the impact of the new technologies" in the area of ICT that is to result in "the neutralization of geography" is said to be over-simplified (Sassen, 2001: 215–6). Some have denounced this rhetoric as proceeding from a "school of optimism," a kind of "techno-orthodoxist worldview" circulating in policy circles where, in its most explicit forms, it proclaims the capacity of optic fiber and satellites to render space and time differences insignificant (Ferguson, 1990: 152). Others have similarly described this rhetoric as characterizing a "politics of optimism" guided by a policy agenda that seems to subscribe to the idea that ICT, in a techno-deterministic fashion, is inherently capable of eliminating the "friction of distance," freeing us of the burden of geography (Robins, 1997).

In the next three sections I will discuss why one should avoid technological determinism, why there is nothing simple about introducing telehealthcare, and why these innovations do not do away with geography.

3

An Introduction to Science and Technology Studies: From Technological Impact to Sociotechnical Assemblages

As was exposed in the overview of eHealth policy offered in the previous section, eHealth is assigned various intersecting and interdependent roles. To repeat only some of them, eHealth is being advocated for its potential to foster better and more affordable healthcare by: making it possible to cross professional boundaries; facilitating the coordination of various healthcare sectors, such as specialist and primary care; reducing the distance between remote populations and clinical centers; improving channels of communication between healthcare staff and between healthcare staff and patients and the elderly; and, not least, offering completely new ways to register and package medical data in novel graphic and digital formats to advance medical examination, diagnosis, and treatment. Faced with this evolving eHealth landscape, one quickly realizes that it is very difficult to make a sustained argument for the benefits of dividing the field into sociopolitical dimensions, on one hand, and technomedical practices, on the other, to then be analyzed as separate spheres. I argue that we need an approach that avoids splitting things up into separate categories. Instead, boundaries ought to be crossed and categories transcended, so that the complex interweaving of interdependencies can be studied *in toto*. The expanding field of STS has provided me with analytical tools allowing this.

Common to many STS perspectives is that the roles of technology and science in society vis-à-vis history, politics, and culture are examined. STS is an interdisciplinary field extending over many academic disciplines. Most notably, it crosses the often-drawn line between the fields of science and engineering, on one hand, and the social sciences and humanities, on the other, in the sense that it makes science and technology the topic of study of the latter disciplines. Medicine and healthcare are increasingly being studied

in STS, whose empirical domain is accordingly often referred to using the initialism STM, i.e., science, technology, and medicine. In the following sections, I will describe the parts of STS that have been important to my studies by tracing some of its developments and implications.

3.1 The Sociology of Scientific Knowledge

The development of the sociology of scientific knowledge (SSK) in Britain in the 1970s (see, e.g., Bloor, 1976; Barnes, 1977; Collins, 1975) was crucial for establishing STS as an academic field. SSK was in many ways a critique of an earlier sociology of science that offered social explanations of “failed” science, be it fraudulent or subject to various “biases,” such as personal, religious, political, and economic interests. The analysis of “successful” science was thought of as beyond sociological reach and was consequently regarded as successful precisely because it was untouched by any social “biases,” confirming popular belief that proper science was a body of knowledge “outside society.” As the famous sociologist Robert K. Merton and his followers would have it, there exists a particular “scientific ethos” that assures that the scientific approach is defined by scientists as distinctly truthful, rational, and disinterested, partaking in making the scientific process of knowledge production relatively distinct from the rest of society and accordingly not open to sociological analysis (Panofsky, 2010). The Mertonian school did not concern itself with the content of scientific knowledge claims, instead focusing on science as a social institution, investigating, for example, power hierarchies and gender biases (Hess, 2001: 240).

SSK, however, challenged the notion of a scientific ethos as well as the assumption that true science is separate from the social realm. The “strong programme,” launched by David Bloor (1976), proclaimed that sociologists of science should be agnostic as to whether a scientific claim was true or false. Instead, they should treat all scientific claims symmetrically as “beliefs” and, by the same token, study the process whereby scientific claims are accepted as “true” or discarded as “false.” With its agnostic stance, this new version of the sociology of science challenged the widespread understanding of the epistemological uniqueness of science common in many traditional philosophical views of science (Berg and Akrich, 2004: 2). By entering into moments of scientific ambiguity before matters were settled, such as controversies over scientific claims and experiments, SSK analysts could demonstrate that doing science did not mean adhering to a unique method, but that scientific fact-building was indeed a social activity that involved processes of

negotiation and relied on historical, cultural, and political circumstances (Law, 2008: 626–7).

3.2 Social Constructivism and Technology

These sociological advances in the study of science would soon be drawn on in mounting a critique of established ways of researching technology and innovation. In a seminal paper, sociologists of science and technology Trevor Pinch and Wiebe Bijker (1984) argued for the usefulness of building on SSK in the study of technology, using it to criticize prevalent economic analyses of innovation as well as work carried out in the history of technology. They accused the former field of recalling the Mertonian version of sociology of science in that, while it analyzed many of the socioeconomic aspects of what might influence the success of an innovation (e.g., the extent of R&D, management strength, and marketing) and coupled these to macroeconomic factors, it failed to discuss the core of technology as a social process. In line with the manner in which SSK had had taken sociology into the heart of science, Pinch and Bijker wanted to see sociological studies of the very content of technology. While they regarded the history of technology as providing fertile ground for such studies, they contended that historians too often fell into the trap of asymmetry: first, because they rarely discussed unsuccessful technology and, second, because they frequently cited the manifestation of a technology/artifact as self-evident proof of its success, thereby obviating the need for any further analysis. In doing so, they came to subscribe to technological determinism, as technological developments were seen as guided by properties claimed to reside within the technologies themselves. Pinch and Bijker, by contrast, argued that any judgment as to the merits (or limitations) of a technology must be understood and investigated as the outcome of its local context and wider sociopolitical milieu. Building on the strong program's principle of symmetry, Pinch and Bijker (1984: 406) stated that: "The success of an artefact is precisely what needs to be explained. For a sociological theory of technology it should be the *explanandum*, not the *explanans*." These advances in the sociology of technology would form an integral part of Pinch and Bijker's further development of their perspective, the social construction of technology (SCOT) and would also be associated with the similar perspective of the social shaping of technology (Mackenzie and Wajcman, 1985).

3.3 Actor-Network Theory

In another school of thought in STS, actor–network theory (ANT), also known as the sociology of translations, the relationship between technology and the social is understood very differently. A central tenet of ANT is that the social and the technical (which applies also to the material in its broadest sense, including “nature”) should be understood as standing in a reciprocal relationship. As such, the ANT framework extends Bloor’s formulation of symmetry as it argues that not only humans, but non-humans, too, should be considered to play equally active roles in the analysis. ANT thus cuts across any divide between the social and the material—something commonly referred to as “generalized symmetry” (Latour, 1993a: 94; Callon, 1986). The social and the technical/material are seen as inextricably interwoven, constituting each other in a relational manner. As Bruno Latour (1993b: 381) expresses it: “it is the same task to define the [technical] artefact tying together the various [social] groups or the groups tying together one artefact.” This implies that studying either one inevitably means investigating the other. The idea of the “social shaping of technology” is hereby extended to the understanding that the technical likewise shapes the social. Accordingly, this means that the role of technology should not be apprehended as passively reflecting human interests, but that the introduction of technology results in the forging of novel relationships that tie together groups in new ways, affecting and constituting “the social” (Latour, 1987: 140).

Methodologically, this means that ANT is not just a way of sociologically studying technology, as advocated by Pinch and Bijker (1984; see above), but is extended into a way of studying the social through its technical and other material manifestations, as they are understood to constitute each other through the way they are patterned in a web of relations (Callon, 1987). “Web of relations” denotes what ANT refers to as a network or assemblage of actors, defined as entities having effects on other entities. Actors, be they human or non-human (e.g., citizens, professionals, or politicians, more abstract concepts such as knowledge and institutions, and material entities such as policy documents, machines, and monetary means), are understood as shaping one another through the way they are positioned relative to other entities comprising the network. This is the actor-network (Callon, 1986; Latour, 1991; Law, 1986). Nothing exists outside relations. This means, for example, that there is no such thing as “technology in itself”. Sometimes the word actor is replaced by the term “actant” to break away from the conception that actors can only be humans (Latour, 2005: 54).

For humans and organizations to reach their goals, they frequently must operate via technology, for example, using a computer system or driving a car. This puts them in a position of dependence, and they must accept the roles of computer user and car driver, i.e., being identified by the technology they use. As such, they are made part of the technology-network because they must put their faith in its continued existence, giving it their support, and can find it very difficult to cope without it. In ANT, intentions designed into a machine or other artifact, such as software and guidelines, constitute what is called a script (Akrich, 1992), i.e., by design, its inventor attempts to guide the user toward the “proper” manner of use. Such use is rarely just a matter of unconditional uptake; in a relational manner, use commonly involves a process of appropriation in accordance with user preferences and goals. This dual movement in relations between entities is what ANT terms translation (Callon, 1986; Latour, 1987). This means that, for example, when an artifact and its associated constituting network is extended into a new environment, a process of negotiation starts in which the artifact and relations of use which are already consolidated enter a process of mutual transformation and configuration. This process is highly unpredictable, because when one enters new surroundings, one finds them already filled with operating networks in which relations between various practices, machinery, professional boundaries, identities, organizational forms, software, regulations, governmental regimes, etc., themselves the outcome of particular patterns of relations, have been previously established and stabilized (Callon, 1987; Latour, 1993, 1999).

If, for example, someone is interested in affecting how others act by introducing a piece of machinery or software, this is not a matter of mere “implementation,” an idea based on the assumption that technology simply transmits properties that somehow remain fixed. Introducing new technology invariably involves renegotiating all sorts of relations between the involved human and non-human entities (Latour, 1986). Similarly, rejecting the idea that technology has intrinsic functionalities (e.g., that it already “works” on leaving the factory) in favor of a relational understanding emphasizing that the workability of technology is an *emergent quality* stemming from how the sociomaterial assemblage is constituted, means that what can be considered working in one network, under certain conditions in a particular situation or location, can similarly be rejected as malfunctioning under other circumstances in a different environment as the translation processes can turn out very differently (Akrich, 1992, 1993; Mol and Law, 1994). This also means that there are bound to be many more or less strongly coupled operating networks, for example, as technology travels between locations and situations.

These can operate in parallel, be well aligned, and overlap, but also compete and clash (Callon, 1986; de Laet and Mol, 2000; Latour, 1987).

The methodological approach thus becomes one of not separating the world into an interior domain of technoscience/technomedicine versus an exterior, surrounding societal domain, but instead understanding these domains to be intertwined. By following the relations and entities wherever they take us, we can trace the sociomaterial assemblages, making it possible to begin to understand the emergence and direction of interests, the proceeding process of translation, its rippling effects, the eruption of controversies, as well as stabilizations and agreement (Latour, 1987).

3.4 Conclusion: Steering clear of Matters of Fact and Technological Determinism through Heterogeneous Intertwinements

To briefly summarize the main arguments presented and by borrowing from Brown and Webster (2004: 37–8): STS, the tradition of ANT in particular, has made a strong claim that the study of technoscience and of the sociopolitical are always intertwined and that one ought not to think of them as *a priori* separate domains. The status, be it positive or negative, given to a scientific claim or a technology should be understood as an effect of the pattering of heterogeneous relations, not as inherent and self-evident matters of fact. As mobilizing facts and machines through linking heterogeneous entities involves processes of translation, their destiny is unpredictable and multiple and they should thus never be seen as self-explanatory or carrying inherent properties. Instead, one should study science, technology, and medicine “in action” (Latour, 1987) by empirically following the forging of relations wherever they take one. Doing so allows one to open the “black boxes” of science, technology, and medicine and reveal their political, cultural, and historical content as well as understand how their manifestations and materializations are drawn on in an effort to establish and give robustness to the social.

STS has opened up new paths for analyzing the social embeddedness of technology and science as advocated in SSK and SCOT. However, as highlighted above in the ANT section, STS-scholars have similarly emphasized that objects and artifacts in turn partake in constituting society. This exposes how the material actively mediates in the shaping of categories often understood as purely social, such as human interaction, organizations, professions, and expertise formation (Berg and Akrich, 2004: 2). STS ideas are today not only used to study science and technology but are integral to sociology and

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have increasingly been drawn on in, for example, organization studies (Cooper and Law, 1995; Czarniawska-Joerges and Sevón, 1996; Woolgar, Coopmans and Neyland, 2009) and social anthropology (Oppenheim, 2007; Rose, 1994; Strathern, 1996). They have also become interwoven with feminist theory (Fox-Keller and Longino, 1996; Haraway, 1991; Wajcman, 2004) as well as Foucauldian studies of various forms of governance (Barry, 2001; Lemke, 2007; Rose and Miller, 1992).

4

Telehealthcare as an STS-topic

The intertwining of technoscience and the sociopolitical is perhaps nowhere more evident than in today's healthcare organizations and the increased computerization and digitalization of everything from administrative and management tasks to the very content of medicine and care. As Casper and Morrison (2010: S121) have noted, healthcare technology has today in many ways moved beyond large machines placed at the patient's bedside toward the restructuring of healthcare provision by positioning information technologies as central to political reforms, financing, and health outcomes. Recognizing the pivotal status given to these developments, social scientists working in the field of healthcare, such as medical sociologists, anthropologists, and healthcare organization researchers, have increasingly turned to STS for inspiration on how to analyze such changes. The domain of eHealth is of course part of these developments. Below I will delineate how this strand of work has put STS tools to use in studies of ICT-facilitated healthcare at a distance, including in studies of: innovations as sociotechnical assemblages, changes in knowledge production processes, how professional boundaries are being affected and work is reorganized, and attempts to form new relationships between healthcare professionals and patients as well as the elderly. I will begin with a section on telemedicine and thereafter turn to the field of telecare for the elderly and patients with chronic conditions. The overview will also serve to introduce the reader to some of the many complexities surrounding the emergence and introduction of these developments. I open the telemedicine section with a short discussion of how (not) to understand the historical emergence of telemedicine from an STS perspective.

4.1 The Case of Telemedicine: Reaching out, Clinical Work, and Intra-organizational Issues

In commenting on the increasing importance attributed to telemedicine in the U.K. policy context by the late 1990s and its alleged novelty, May et al. (2001: 1890) write that there is hardly anything historically new about using communication and imaging technology for clinical purposes. Instead, they cite the early use of the electric telegraph to transmit X-rays and to the application of telemetry to medically assist seafarers since World War II as well as in manned spaceflights. Elsewhere, May and Ellis (2001: 990) sketch a history of telemedicine as moving from “primitive” devices such as pre-WWI telephone stethoscopy to post-WWII ultrasound imaging and its potential use with closed-circuit TV systems, followed by rapidly mainstreamed advances in digitalization and high-bandwidth telephony, which drastically reduced the costs of telemedicine innovations.

Descriptions such as these can easily give the impression that there is really nothing new happening here other than the technical refinement and price reduction of existing innovations. This is a good example of the type of analysis of technology that Pinch and Bijker (1984) criticized for failing to address the context of these developments and their wider social embeddedness. Drawing on STS and commenting on telemedicine specifically as well as innovation more generally, Webster (2007: 171) writes that, whereas it is possible to write the history of an innovation as a move from the primitive to the advanced, from the analog to the digital, or from the expensive to the cheap, the focus should preferably be on the new sociotechnical relationships innovations might bring about. Otherwise, one risks ending up in a situation recalling Guattari’s (1995: 40) example of mistakenly proposing that the invention of a steam-powered child’s toy in the Chinese Empire served as the prototype for the steam engine of the Industrial Revolution. The wider sociopolitical context is clearly critical when describing what is novel.

Having this line of thinking in mind, the emerging use of telemedicine in the early 1970s in the highly specialized fields of arctic expeditions, offshore oil exploration, the space program, and the U.S. military does not inherently translate into the increasing initiation of rural telemedicine programs in the 1990s, for example, in remote parts of Norway and the U.S.A. (Darkins and Carey, 2000). Whereas it would be possible to describe all these developments as sharing the goal of accessing medical expertise through advances in ICT, leading to the diffusion of telemedicine in a linear manner from highly specialized areas toward increased mainstreaming, this hides key political differences within telemedicine. Whereas the former applications were all

associated with ambitions to conquer and master territory, later rural applications were instead anchored in a regional policy environment dominated by issues of scarcity and inequity in healthcare provision. This is well in line with the WHO's acclaimed interest in telemedicine as presented in the previous policy overview. As a further example of the shifting politics of telemedicine, it is worth noting its promotion in prison environments where it is being used to avoid possible security risks incurred when transporting inmates to outside healthcare facilities (Sinha, 2000: 294).

To explain the existence of the many varying versions of telemedicine, Klecun-Dabrowska and Cornford (2002) have drawn on ANT to address how telemedicine does not have an inherent identity. Instead, they note that its purpose stems from how its material manifestations and involved communities are tied together in heterogeneous networks whose compositions have shifted at various times and between situations. They argue that these transformations should not be explained through the lens of a linear, cumulative process of development, but that the various versions highlight how telemedicine has been, and is, involved in an ongoing process of reinterpretation and reinvention as it becomes attached to shifting environments and sociopolitical milieus.

Though niches of prisons, space flights, and offshore oilrigs abound, the coupling of telemedicine and the rural in the 1990s would bring telemedicine closer to the very center of the healthcare political agenda, as increasingly attachment to ruralness meant that telemedicine entered into discussions of the proper responsibility of the state for its citizens' wellbeing coupled with health economics and issues concerning access to and availability of healthcare resources. Telemedicine in the context of responding to the local needs of underserved communities has often served as the very *raison d'être* of telemedicine, reaching out via telecommunications from medical centers of expertise in metro areas to remote populations lacking nearby healthcare services. Advocates of rural telemedicine have seen it as a way to better manage supply and demand, evening out the concentration of healthcare resources in urban areas vis-à-vis its scarcity in rural regions. This has resulted, for example, in the development of "hub and spoke" models in which a single medical center of expertise serves several rural "spokes" via communication infrastructure (Sinha, 2000: 303). The combination of software and hardware with copper or fiber optic communication lines has come to offer a technical fix fueled by hopes of overcoming longstanding differences in health outcomes between rural and urban regions (Curtis, 2004). However, as will be discussed in the following paragraphs, whereas telemedicine by definition opens up new lines of communication between locations, what should be

addressed by setting these in place is not inherent in the infrastructure itself but, as STS insists, is subject to negotiation.

The 1990s has been described as the period when telemedicine boomed (Linderoth, 2003: 1). For example, in 1993 “telemedicine” achieved the distinction of becoming a medical subject heading in PubMed, a life science database that may be the largest in the world. This meant that, from now on, academic papers could be indexed using the term telemedicine, increasing telemedicine’s visibility. Simultaneously, healthcare political interest in telemedicine as a way to manage access to healthcare resources for remote populations would expand into an interest in using telemedicine to manage access to and demand for healthcare systems at large. This takes us back to the opening lines of this section and the increasing importance attributed to telemedicine in healthcare policy in the 1990s in the U.K.—not a country commonly associated with remote populations. Instead of being addressed primarily as a way to manage the scarcity of healthcare resources in remote areas, in U.K. policy, telemedicine was instead translated into a means to address experienced *structural* problems of scarcity, for example, instance shortages in the number of employed specialists (May and Ellis, 2001: 990). Similar translations have been made in many other countries as well (Gherardi, 2010: 509–10). This is reminiscent of how, as mentioned in the policy overview, the WHO and the EU were seen as describing telemedicine’s relevance in many industrialized nations as being about efficiency and organizational streamlining set in a context of the pressure of having to do more with fewer resources. In the vocabulary of ANT, in this context, telemedicine has emerged in a very different sociotechnical assemblage from the remote population version.

However, as highlighted in the preceding theoretical section, even within a single sociotechnical network there are bound to be different appropriation processes depending on how the purpose of usage differs between constituent actors. The STS-inspired work on U.K. telemedicine carried out by Maggie Mort, Carl May, Tracy Finch, and collaborators around the turn of the century provides insights into such processes of negotiating what the purpose of telemedicine should be. Drawing on their combined work and using ANT concepts, these scholars described the simultaneous existence of a weak and a strong program in the British telemedicine actor-network (Mort et al., 2004). They saw the weak program as emerging from a healthcare policy agenda of “modernization.” This program was committed to supporting a version of telemedicine as a vehicle for improving service delivery by, for example, emphasizing its role as a tool for speeding up and enhancing performance and boosting efficiency by simplifying access to information. As such, the con-

tent of medicine in telemedicine was largely ignored. The strong program, on the other hand, was represented by the clinical research and development mode. To the members of the strong program, frequently physicians, the clinical materializations of telemedicine were by necessity anchored in medicine. Accordingly, they promoted a version of telemedicine as something that had to undergo what May et al. (2003a) have referred to as a process of “medicalization,” meaning that it had to be adapted to the clinical situation of use.

What the notion of the strong program and the process of “medicalization” emphasize is that when telemedicine is to be incorporated into clinical work this should, as Gherardi (2010) argues from an ANT perspective, not be seen as being about implementing “technology in itself.” Instead, as May et al. (2001) have stressed, its introduction sets in motion complex processes that affect the way medical and care work is organized and practiced. Hence, though governments have introduced ICT and telemedicine into their healthcare organizations precisely because they want to change the way it operates, STS-inspired work has time and again pointed to how the outcomes of such efforts are highly unpredictable (Halford et al, 2010: 446; Olesen and Markussen, 2006; Vikkelsø, 2010). Accordingly, one should not mistakenly regard the introduction of ICT and telemedicine as simply entailing “rolling out” a technical fix in an existing clinical organization (Berg, 2001: 154).

Some complexities of the introduction of telemedicine have been investigated by Mort et al. (2003) in an ANT-based study of a U.K. telemedicine project in dermatology. In line with the weak program, the project was not intended to overcome distance from the doctor but to speed up referrals in a densely populated urban area. The project was based on giving nurses a new, expanded role, working as intermediaries between patients and doctors. Instead of showing patients into dermatologists’ offices, nurses were now supposed to be the first line of examination, rotating between local health centers where they acquired images of skin lesions with digital cameras and used software to record patients’ case histories and then emailing the resulting files to the doctors. This renegotiation of roles and responsibilities confronted dermatologists with new ways of “seeing” patients, affecting the process of knowledge production in ways with which they did not always feel comfortable. Previously basing their practices on patients walking through the door into their offices, the dermatologists now had to work out a diagnosis from the emailed images and pro forma clinical histories constituting the data files that the nurses forwarded to them. For this process to work at all, it turned out that the pre-trial focus on confirming the validity of images for diagnostic accuracy was far from sufficient. Instead, the service was dependent on all

sorts of additional work carried out by the nurses when interacting with the patients, be it taking blood samples, the precise way they recorded and forwarded the case histories, or the way they initiated investigations (Mort and Smith, 2009: 224).

However, the installation of new equipment at the clinic does more than simply decisively transfer some inherent functionality. Instead, the installation initiates a process of negotiation whereby actors can reformulate the intended purpose of the artifacts. Linderoth (2002), for example, emphasizes how the hardware and software used in telemedicine (often not originating within healthcare at all, such as e-mail and the off-the-shelf digital cameras the nurses used in the dermatology study) frequently tend to drift as they start to be used. When these artifacts meet the daily grind of clinical work, i.e., enter the process of “medicalization,” they are transformed and contextualized as they are integrated into the reorganization of practices, professional hierarchies, and knowledge production. As Nicolini (2006) argues, this leads to healthcare staff frequently renegotiating the purpose and use of telemedicine practices. This often results in outcomes that differ greatly from what was intended and expected by those initiating the project, sometimes leading to their dismissal.

Returning to the rural context, Kari Dyb and Susan Halford (2009) build on ANT to provide examples of the materialization of a telemedicine project intended to fulfill the Norwegian government’s commitment to provide good healthcare services to its citizens living in the country’s most sparsely populated regions. By providing a small island hospital with a broadband connection enabling midwives to transmit real-time ultrasound and cardiotocography digital images to obstetricians at a mainland hospital, the overall standard of care for pregnant and delivering women on the island was expected to improve. However, the midwives frequently saw themselves as more knowledgeable and experienced than the mainland obstetricians, who were often young and still in training. Instead of understanding that knowledge resided in the abstract images forwarded and read in a simplified and standardized manner, midwives came to emphasize their acquired tacit knowledge, how they were personally familiar with the pregnant women, and the importance of other senses apart from just eyesight, such as smell and touch. Moreover, the midwives felt that they could not rely on immediately reaching an obstetrician in the often acute situations that could arise during deliveries. Instead of turning to the mainland obstetricians, the midwives preferred the assistance of colleagues and the resident emergency surgeons who shared much of their experience, leaving the system only occasionally used.

Taken together, much STS-inspired work on telemedicine has indeed observed the high expectations attached to telemedicine, while also noting the complexities involved in stabilizing it as an integral part of clinical work. Not only does the introduction of telemedicine almost inevitably affect established organizational routines and medical practices, but it also frequently leads to the renegotiation of the intended purpose of its use. As May et al. (2001: 1891) write, this has meant that, whereas telemedicine has become an established research field among others, with its own scientific journals, conferences, research groups, etc., the many initiated trial and demonstration projects have rarely survived beyond the test phase. Frequently, they have in fact even failed to stabilize long enough for any initiated evaluation to be completed (May, 2006: 528). There are some exceptions though: for example, the application of telemedicine in radiology for the transmission and storage of digital x-rays has normalized to the degree that, ironically, few today even regard it as doing telemedicine (May et al., 2005: 1489).

However, as Nelly Oudshoorn (2011: 68) writes, though the high hopes invested in telemedicine have led to disappointments, the promise of ICT-enabled healthcare at a distance has by no means been abandoned. Instead, interest has been channeled into other arenas. In the next section, I will describe one such important arena that was discussed in the policy overview, namely, telecare, which has attracted interest from many governments across the developed world (Milligan, Roberts, and Mort, 2010: 353), and look into how social science scholars have studied telecare and applied STS in their analyses.

4.2 The Case of Telecare: Healthcare Services Reaching into Individuals' Everyday Lives and New Forms of Governance

Telecare has been described as part of the technical evolution of more advanced generations of innovation in telehealth focused on the increasingly automated handling of healthcare information, now also extending to the home environment (Whitten and Davenport Sypher, 2006). (Telehealth, like the term telehealthcare, is sometimes used to denote all these “at a distance” services.) As we are by now well aware, according to STS thought, depicting innovation as the mere advance of technical progress represents a limited understanding of innovation, as STS scholars have repeatedly illustrated how technology always has sociopolitical implications. In the policy overview, I accordingly described how telecare is deeply intertwined with a set of problematizations that have risen high on the healthcare political agenda: how

should societies in the best and most appropriate way handle the growing numbers of elderly and of people diagnosed with chronic conditions that put increasing pressure on healthcare organizations? As explained by Daniel López (2010: 39), writing from an STS perspective, more than being merely a new technical innovation in health-related monitoring, telecare is understood by many of its proponents as an important means to accomplish urgent economic, political, and social transformations.

Many of the ideas underlying the promotion of telecare build on the prediction that continuously monitoring health and lifestyle patterns in the home environments of the elderly and patients with chronic conditions makes it possible to take preventive measures and thereby minimize risk (Mathar, 2010; Milligan, Mort, and Roberts, 2010: 34). In doing so, the quality of both life and care for these individuals is expected to increase as, for example, sickness episodes and deteriorating conditions can be avoided. This is anticipated to enable these people to remain out of the traditional medical and care institutions, which is expected to help contain costs and alleviate the burden on already strained staff resources. In the case of telecare for the elderly, applications can involve systems for fall detection, monitoring movement and sleeping patterns, and automatically reading the pulse as well as remotely monitored stove alarms. These systems are generally thought likely to preserve safety and wellbeing by allowing for rapid response should it be needed. When these arrangements for monitoring environmental, activity, health, and general lifestyle patterns are combined and networked, one can then speak of the “smart home.”

“Telemonitoring” solutions for those with chronic conditions often target the big three: diabetes, chronic heart failure, and chronic obstructive pulmonary disease (Pols, 2010: 172). Like telecare systems for the elderly, these solutions encompass the monitoring of physical health and lifestyle changes in the patients’ everyday environments. However, unlike largely automated solutions for the elderly, telemonitoring equipment is generally supposed to be operated by the patients themselves. Depending on the specific condition, these solutions consist of various instruments to, for example, measure weight, heart rate, or lung capacity in combination with various software applications (sometimes installed in mobile phones). The software allows the frequency of lifestyle habits such as smoking, drinking, and exercising to be recorded; these solutions might also include the ability to report symptoms. By incorporating certain algorithms into the software, it may be possible to calculate health trends, detect risks, and make them visible to patients on their computer/mobile screens. As in the case of telecare applications for the elderly, telemonitoring also involves remote supervision by health profes-

sionals. For example, if the system signals that a particular set threshold has been surpassed, such as an increase in weight, professionals may act by calling the patient to see whether any problem needs to be addressed.

From an instrumental perspective, these developments could be described as more of the same, as replication (Oudshoorn, 2008: 401, 2011: 18): i.e., the intensification of existing care of the elderly and chronic-care patients already administered by medical and caring personnel but now made more efficient and less labor intensive by being largely computer based. However, as May et al. (2005: 1492) argue, telecare combines medicine and care with governance aims in new ways that inevitably reconfigure both healthcare personnel and service users. Based on Foucault's notion of governmentality, i.e., "the techniques and strategies by which a society is rendered governable" (Jones, Jones, and Woods, 2004: 173), May et al. (2006) have labeled governmental initiatives in telecare "technogovernance," employed in an effort to govern and structure the work of healthcare professionals and the roles and subject positions to be occupied by service users. The design and modeling of these systems constitute, as Lehoux (2008: 87) claims, a socially embedded process in which the perceived needs and preferences of society, healthcare personnel, and service users are translated into sociotechnical configurations. The introduction of telecare largely involves the delegation and distribution of roles and tasks between healthcare professionals and service users, and between humans and machines (Oudshoorn, 2008: 273). Unlike telemedicine, which is used *within* the healthcare organization, telecare unavoidably also raises issues concerning "the interplay between social citizenship and individual freedom" (Percival and Hanson, 2006: 905). This is because its extension outside traditional healthcare institutions requires that individuals accept the continuous monitoring of their health and whereabouts in their living environments. Drawing on ANT, Mort, Finch, and May (2009: 11) speak of how the technological scripting in telecare interweaves governance aims with ideas about service user engagement. However, as mentioned in the policy overview, although the elderly and chronic-care patients are very much overlapping groups, the engagement expected of them tends to differ considerably between telecare discourses and system designs, for example, as denoted by the configuration of telecare as smart home concepts for the elderly and telemonitoring for those with chronic conditions. The individual freedom attributed to the former is largely framed as a matter of achieving "independent living," remaining in one's own home as long as possible, by allowing oneself to be remotely overseen by healthcare professionals. Chronic-care patients, on the other hand, are generally not positioned as passive, remotely monitored subjects, but are supposed to be liberated by being "empowered"

to actively use tools to participate in self-care, which is expected to improve their knowledge of how to master their conditions. I will return to the differences between these ascribed roles.

In the case of the delegation and distribution of tasks between healthcare professionals, Christine Milligan, Celia Roberts, and Maggie Mort (2010: 352) note that the introduction of telecare may imply a downward spiral of responsibilities. Tasks previously carried out by doctors could, for example, be delegated to nurses or less educated staff employed at special telecare centers (which, as Oudshoorn, 2011: 12, observed, in some countries are operated by private health insurance companies) working only through such telecare systems. This redistribution often involves a shift to protocol-managed work, meaning that staff work according to specifically developed guidelines following, for example, so-called best medical practice and that structure staff performance as a set of tasks to be carried out in a certain order. Sometimes the computer software incorporating the protocol does not allow staff to proceed if fields on the screen are left blank (Oudshoorn, 2011: 119). However, although these protocols are artifacts designed to structure conduct, enrolling personnel in acting in certain ways, staff frequently feel the need to work around them to carry out their duties. Oudshoorn (2009: 398–9) describes how the telenurses examined in one of her studies of the remote monitoring of patients with chronic heart failure did not accept the routines that specified that nurses were only to call patients when they were notified of deviating blood-pressure and weight readings. To the nurses, this scripting meant that, if these values did not deviate, they could not establish any contact with the patient and hence felt unable to build trust and be in control of the situation. They accordingly overruled the script and decided themselves when it was appropriate to call. Similarly, Roberts, Mort, and Milligan (2012), in a study of a telecare service for the elderly, found that whereas the service was designed to be highly protocol driven, the calls made by telecare center operators to the residences of the elderly in response to alarms did not follow the protocol. Instead, operators developed their own personal styles, downplayed the script, and treated the conversation protocol flexibly, choosing to listen carefully to try to comprehend and judge the situation at hand. As Oudshoorn (2009: 393) describes, in a situation of not meeting the patients face to face, the staff operating the system must develop other ways and competences for handling the situation, for example, by listening for vocal clues (e.g., breathing patterns and silences) over the telephone and learning how to get the most out of computerized decision-support tools. Roberts and Mort (2009: 144) write that, despite governmental and technical discourses perceiving this aspect of telecare services as rather

straightforward and unproblematic, these emerging sociotechnical configurations of healthcare practices demand a great deal from the staff operating them, including instances of “repair work” such as improvisation and workarounds (Roberts, Mort, and Milligan, 2012: 495). These protocols and the automation of telecare can only do so much: humans are still greatly needed for interpretation, deciding what action to take, and executing it. Oudshoorn (2008) attributes the failure to recognize this to the overlooking of “invisible work” (Strauss, 1985; Star and Strauss, 1999), i.e., the kinds of skills and knowledge that go unacknowledged and are easily unrecognized when what is privileged in the general discourse is technology and its strong associations with automation believed to reduce the need for human labor. Roberts, Mort, and Milligan (2012: 491) therefore advocate understanding and acknowledging that new care technologies such as telecare “reconfigure rather than reduce the challenge of caring.”

As mentioned, these reconfigurations inevitably also affect the elderly and the chronic-care patients monitored by these applications. For example, as May et al. (2006) pointed out above, these reconfigurations involve ideas about certain positions to be occupied by targeted individuals. A major justification for monitoring people in their living environments concerns the argument that it is expected to promote increased self-governance and thus improve patient freedom, resulting in increased independence. Both the notion of “independent living” in the case of the elderly and the concept of “empowerment” associated with chronic-care patients are loaded with such promises of setting patients and elderly free. This could easily be framed as a matter of achieving greater autonomy. However, as Henriette Langstrup (2008: 124) explains, autonomy implies the existence of a free human subject, an individual who has managed to escape relying on others. However, this would imply a human subject free to act by standing independent of relationships, a possibility denied by ANT, as the opportunity to act is not understood “as an intrinsic feature ... but as a relational effect arising from arranging heterogeneous elements in a certain way” (López and Domènech, 2008a: 672, n. 9, building on Latour, 1997). Thus, in the vocabulary of ANT, rather than signifying independence, telecare services denote new sociotechnical configurations of human/non-human *interdependencies* (Schillmeier and Domènech, 2010: 4).

In the case of telecare for the elderly, the notion of independent living is in fact often sustained by positioning the elderly as dependent and vulnerable. Telecare can, for example, be cast as offering elderly needed “peace of mind” (Roberts, Mort, and Milligan, 2012: 492), or as keeping watch of their “fragile” bodies (López and Domènech, 2008b: 187). The aim of achieving a sense

of independent living is conditioned on the elderly allowing the installation of systems for remote monitoring, increasing their dependence on others (i.e., those supervising the system), and on the assumption that they and the system will, for example, detect a fall and respond quickly (López and Domènech, 2008a: 663).

As Daniel López and Miquel Domènech (2008b: 184) point out, if telecare can from the outset appear to be a service that promotes something like autonomy, this is because it enables the elderly to sustain the interdependencies that make them feel at home. Accordingly, they are not set free from relations but helped to uphold and maintain them by the introduction of the telecare service. To preserve this sense of a sustained familiar home environment, designers go to great lengths to make systems and devices as physically invisible as possible (Milligan, Robert, and Mort, 2011: 353). In this regard, telecare by its design “respects” the boundaries of the home and, unlike many traditional homecare services, is often camouflaged, being attentive without interfering if everything proceeds as considered normal (López and Sánchez-Criado, 2009: 354). As López and Domènech (2008b: 184) argue, in this way, telecare does not serve to discipline the elderly but serves to oversee, looking after without touching, able to quickly mobilize necessary relations should the service alert its attendants that the elderly have failed to sustain the monitored dimensions of their everyday lives.

Like these telecare services for the elderly, telemonitoring services for chronic-care patients are also continuously connected to the clinic by wired and wireless solutions such as the Internet and the (mobile) phone. Patients are not set unconditionally free to self-manage but are asked to actively engage in a new sociotechnical collective of devices, software, and healthcare professionals that together manage the condition (Oudshoorn, 2011: 181). According to May et al. (2005: 1492), it is important to be clear that, although telemonitoring involves a desire to mitigate medical paternalism and return control and the capacity to handle one’s condition to empowered “expert patients,” it also permits the surveillance of the patients themselves, which could lead to the quality of their self-care being questioned. It is not uncommon for medical professionals to understand telemonitoring as a means to improve patient compliance and confirm that patients are following the stipulated treatment plan. Unlike the “passive” telecare described above for the elderly, telecare services for those with chronic conditions, in the somewhat harsh words of Oudshoorn (2011: 11), “aim to discipline patients to inspect their bodies regularly by inscribing the required actions in technological devices that are subsequently controlled by healthcare professionals and technical devices.”

In both versions of telecare, targeted individuals can hardly be described as becoming autonomous. Instead, they are enmeshed in a new sociotechnical network that reconfigures their agency. Whereas both versions carry certain scripts, albeit differing greatly between them, the elderly and chronic-care patients do not just blindly obey these scripts but are involved in translating them to their needs and preferences. Milligan, Roberts, and Mort (2011: 351), for example, describe episodes from their telecare studies in which the elderly “misused” the telecare services to set off alarms to obtain social contact. López and Domènech (2008b: 194, n. 9) have pointed out how the elderly appreciated the telecare services because their focus on minimizing the dangers threatening a body at risk by constant monitoring in fact made it possible to take risks, as the elderly knew that they were connected to the telecare service if anything should happen. In the case of telecare for patients with chronic conditions, Oudshoorn (2008: 278) has described how patients sometimes found it too difficult to handle the devices, and refrained from using them. Oudshoorn (2011: 182–4) has also observed that patients sometimes do not want the services, as they constantly remind them of their conditions, so they resist using them because they want to retain control over their bodies. It has also repeatedly been noted that patients often do not so much engage in self-care in line with the empowerment discourse but instead prefer simply to forward their data to healthcare professionals, making the staff responsible for taking action (Lehoux, 2008: 90; Mathar, 2010; Pols, 2010), a strategy encouraged by both system design and, for example, involved nurses (Langstrup, 2008: 123; Oudshoorn, 2011: 188). Both the elderly and patients with chronic conditions can thus use telecare in enabling ways, though perhaps in ways contradictory to the intentions underlying the introduction of telecare.

Like the STS-informed research into telemedicine, STS-inspired studies of telecare have highlighted the complexities involved in introducing telecare, although there are also some notable differences. Telemedicine studies have to a great extent centered on contrasting government ambitions to the clinical realities encountered by healthcare professionals. Telecare studies, in contrast, have focused more on investigating how care and societal governance are intertwined in telecare in efforts to inscribe new subject positions for the elderly and chronic-care patients.

As we saw from the policy overview, EU policy actors have high expectations that telecare will play a significant role in creating sustainable healthcare organizations in the future. Still it is important to note, as Oudshoorn has done, that despite many clinical tests and pilot studies carried out, for example, in the U.S.A. and Europe, telecare is not as yet a stable field of practice (2011: 69). Similarly, Jeanette Pols (2010: 171) writes that it is

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still very unclear how telecare will change healthcare and whether it will result in any of the projected improvements.

However, in describing the details of telemedicine and telecare in these two sections, I have deliberately refrained from explicitly discussing the fact that they serve to connect healthcare professionals, patients, and the elderly “at a distance” from each other. The next section compensates for this by examining only this matter: I will argue that, whatever its advocates claim, eHealth and its associated fields of application, will not contribute to “the death of distance” (Cairncross, 1997) whereby space and time cease to matter.

5

A Geography of Heterogeneous Relations: The Interweaving of Sociotechnical Assemblages and Spatiotemporal Formations

In the previous section, I used ANT to criticize any conceptualizing of telemedicine and telecare as self-perpetuating technologies with predetermined functions ready for implementation. Instead, I argued that introducing telemedicine and telecare should be understood as involving processes of translation/negotiation between a heterogeneous set of entities in which the (highly unpredictable) outcome was best described as comprising a sociotechnical web of relations. However, omnipresent throughout these discussions of the relationship between the technical and the social has been the separation of healthcare personnel, patients, and the elderly in space and time, now supposed to be brought together by virtual and digital means. As was highlighted in the opening pages of this thesis, the possibility of defeating the obstacles of space and time is the very *sine qua non* of telehealthcare to the point that, following Milligan, Roberts, and Mort (2010: 348), telehealthcare is defined as “inherently geographical” by many of its proponents. Explicitly investigating telehealthcare’s geographical dimensions is thus vital to addressing telemedicine and telecare in a fully critical way. This is especially the case when one realizes, as many geographers have emphasized, that spatial and temporal relations should be understood as also constituting relations of power and knowledge (Harvey, 1989; Massey, 2005; Murdoch, 2006).

In this section, I will demonstrate how to extend STS to incorporate a geographical concern so that it becomes possible to examine how the spatio-temporal is integral to telehealthcare and its community of policymakers, clinical champions, developers, etc. I will continue to build on ANT and the analytical tools and concepts already introduced. They will provide me with the necessary foundation to present several additional ANT concepts that will also let me explore the geographical dimensions of telehealthcare. In doing

so, I will illustrate how my investigations of the sociotechnical power and knowledge relations running through telehealthcare can be extended into and intertwined with the spatiotemporal domain. The previous section on ANT illustrated how the ANT approach criticized an instrumental view of technology as having clear and well-demarcated boundaries from surrounding society and instead advocated replacing this with a relational view of the technical and the social as heterogeneous. This relational emphasis will, by introducing a set of geographically informed ANT concepts, similarly also serve to make it possible to go beyond prevalent understandings of the spatiotemporal as just an abstract, fixed, and neutral backdrop to the social. Instead, I will illustrate how the spatial and temporal are bound together in the composition of sociomaterial arrangements (Murdoch, 2006).

In further developing my argument for the relevance and usefulness of studying the spatiotemporal dimension of telehealthcare through the lens of ANT, I will draw on geographer Stephen Graham's (1998) presentation of three prevalent perspectives on understanding the connection between ICT and geography. By doing so, it will be possible to sort out and specify various discourses of space and time circulating around and within telehealthcare. Graham labels the first the "substitution and transcendence" perspective, which he describes as dominated by technological utopians. The second he calls the "co-evolution" perspective (not to be confused with the notion of co-production used in STS); this concept draws on academic critique developed in political economics. The third perspective Graham calls the "recombination" perspective, which takes us back to the beginning of this section because it is derived from ANT. I will continue to combine theory with empirical examples by drawing on previous social science work on telehealthcare and adjacent areas and focus on aspects relevant to this thesis.

5.1 Telehealthcare and the Substitution and Transcendence Perspective: A Case of Technological Determinism

The substitution and transcendence perspective is, according to Graham (1998: 168), distinguished by the hyperbolic idea that, through ICT, we will become "liberated" from the constraints of space and frictional effects of distance. Anything becomes possible anywhere and at any time All information becomes accessible everywhere and anywhere." To Graham, such proclamations are driven by a technological determinism "[t]hat is extrapolating the 'logic' of the spatial impacts ... from ... the intrinsic qualities of the technologies themselves" (Graham, 1998: 168). This fits squarely with what

Dyb and Halford (2009) describe as a prevalent spatial rhetoric attached to visions of establishing virtual healthcare networks in which space is framed as abstract, formal, and functional, presupposing that a technology-enabled flow of information will inherently enable the de-spatialization of healthcare as locations and institutions are digitally connected. It also closely resembles the argumentation described in the policy overview, being joined in the belief that combining healthcare with telecommunications and computer power in telemedicine will enable the removal of geographical barriers, national borders, and divisions between institutional levels of healthcare. The extension of standardized healthcare spaces into citizens' everyday lives by telecare, including mHealth, therefore represents the next logical step in creating a boundless health space that would further increase both the efficiency and quality of care.

However, this discourse has met with considerable criticism from social scientists, who have explicitly commented on telemedicine and telecare from the perspective of their geographical imaginations and the implications of these imaginations. In the next section, I will present and analyze one line of such criticism that I believe can be understood through the lens of Graham's co-evolution perspective. Such criticism will then be elaborated on in the succeeding section, but now by thoroughly describing the recombination perspective and a strand of geographically informed social science that can be positioned within it.

5.2 Telehealthcare and the Co-evolution Perspective: The Social Production of Space

Unlike the techno-optimistic discourse characterizing the substitution and transcendence perspective, the co-evolution perspective critically analyzes the politico-economic power vectors involved in these spatiotemporal (re)configurations. In contrast to the "death of distance" and the "neutralization of geography" discourses of the substitution and transcendence perspective, the co-evolution perspective rejects technological determinism by instead understanding electronic space and geographical space as jointly and socially produced (Massey, 2005: 97). By doing so, it does not believe that "virtual space" somehow replaces "physical space," liberating us from its possible constraints. Instead, virtual and physical spaces are interwoven and blurred into a shared and complex social fabric of relations. In the words of Graham (1998: 176), the co-evolution perspective "allows us to reveal the socially contingent effects of new technologies, the way they are enrolled

into complex social and spatial power relations and struggles, and the ways in which some groups, areas and interests may benefit from the effects of new technologies, while others actually lose out.”

Cutchin (2002), for example, therefore acknowledges possible geographical positives as outcomes of the introduction of telemedicine initiatives, such as increased access to specialists. However, he also asks us to be cautious regarding the introduction of additional problems of power and inequality when virtual and material care spaces become intertwined. As Cutchin, from his U.S. perspective, depicts a situation of federal initiatives to provide underserved populations with adequate healthcare, he also predicts that telemedicine will offer medical care organizations in the market-based U.S. healthcare system new ways of competing for business. He believes that this might not be of unequivocal benefit to patients, but might very well add to existing problems of access. In a similar line of argument, Sinha (2000) is wary that the introduction of telemedicine will foster centralization, making it possible to relocate existing resources *away* from the periphery to the core, for example, from the rural to the urban. This could imply cutting support to established healthcare infrastructure on the ground and shifting investment to telemedicine solutions.

Cartwright (2000), similarly, takes us beyond what she calls a utopian optimism in which telemedicine is simply about promoting more democratic healthcare systems and benevolent reaching out to the underserved. Instead, she illustrates the complexities involved when new geographical coordinates are being introduced through the application of telemedicine. On one hand, Cartwright, like Cutchin (2002), highlights how market logics can operate through telemedicine, potentially allowing healthcare organizations to amass client populations on a worldwide basis, creating new economies of scale and eroding the experience of distance. On the other hand, she exposes almost reverse spatial logics in motion when she points to how telemedicine could likewise serve to uphold distance as it also becomes possible, for example, to control disease remotely. As Cartwright illustrates, through telemedicine, physical mobility and transport can be replaced with medicine enacted by electronic transmission in an effort to prevent disease from crossing national borders between, for example, industrial nations and the developing world. Thus, even being connected to the digital world instead of being on the other side of the digital divide does not necessarily lead to the removal of geographical barriers but might serve to consolidate them.

In sum, these social scientists are highly skeptical that ICT and processes of digitalization will enable healthcare to enter a state of equilibrium in which power differentials are neutralized as if due to some kind of weightlessness

caused by the virtualization of information into bits of data. In line with the co-evolution perspective, their accounts question unequivocally positive outcomes of the creation of global and virtual healthcare flows. Instead, they argue that the virtualization of healthcare might very well reproduce existing inequalities while producing new core–periphery configurations, which will always benefit some more than others.

May et al. (2005) have further highlighted some of the politico-economic ambitions at work in attempts to reshape healthcare geography using telemedicine and telecare. They have noted how the initial aspirations of service developers, clinicians, and politicians in the U.K. to bring doctors and patients closer together by means of telemedicine have been challenged as problems of managing increasing demand with strained resources have escalated. Accordingly, they have noticed that the spatial ambitions seem to have shifted within telehealthcare, from telemedicine and an emphasis on proximal relations toward focusing on telecare and mHealth solutions for managing chronic-care patients outside of traditional healthcare facilities. May et al. (2005) thus argue that due to the growing number of patients diagnosed with chronic conditions, increasingly attached to a discourse of the “expert patient” who engages in activities of self-care, telehealthcare systems in the U.K. are today also developing “practices intended to *keep* patients at a distance” (2005: 1493, italics in original).

The way telecare makes it possible to virtually link healthcare facilities with individuals’ everyday environments through, for example, teleoperators working from call centers, has prompted social scientists to speak of the deterritorialization of the physical structure of traditional healthcare institutions (Milligan, Roberts, and Mort, 2011). However, this is not claimed to mean the dematerialization of healthcare delivery but rather that new care sites are being connected by computers and (mobile) phones. Writing on deterritorialization serves to highlight how telecare connotes a spatial shift from healthcare predicated upon patients’ and care-recipients’ physically attending medical and care institutions toward networked healthcare occurring within and between an array of connected sites whereby it becomes possible to bring care into the home while delivering it remotely (Milligan, 2009: 89). This fits well with how Graham (1998: 174) illustrates the co-evolution of physical and electronic spaces, for example, by recalling Mitchell’s (1995: 49) argument that institutions today are not only supported by buildings but by telecommunication and computer software as well.

What these studies of telehealthcare demonstrate is that space and time do not exist as a value-free backdrop “outside” of society, nor that space is a “container” composed of absolute coordinates with time as its spatial fourth

dimension (Kavanagh and Araujo, 1995: 105), but that they serve as organizing principles that are neither neutral nor fixed (Warf, 2011: 143). Instead these studies have displayed that telemedicine and telecare contain both opportunities to erode the effects of spatial and temporal barriers and possibilities to erect them as well. Although telehealthcare can be useful for creating new spatiotemporal conduits by means of electronic infrastructure, its application does not contain an inherent logic decisive for the outcome of these spatiotemporal formations, but involves processes of negotiation that, as the co-evolution perspective emphasizes, are highly political.

5.3 Telehealthcare and the Recombination Perspective: A Fully Relational Geography of Heterogeneous Associations

Although the co-evolution perspective productively reveals the political and power vectors embedded in the configuration of space by technology, it risks positing technology as a passive conduit for human actors' ambitions to socially reconfigure space by connecting territories and buildings via electronic communication networks. Graham (1998: 172) writes that the co-evolution perspective is about "theoretically analysing the broader roles that new telecommunications and information technologies play in supporting the production of new types of spatial arrangements." However, if technology is assigned a supporting role and is understood as only *facilitating* spatial (and temporal) processes, technology is in danger of becoming an absent present. That is, it is made central to the investigated social change brought about by reconfiguring the spatiotemporal but not to the critical analysis itself (Dyb and Halford, 2009: 234). As Kirsch (1995) puts it, this means that technology is analytically reduced to the function of a mere "crowbar" for changing the social experience of space and time, and that its dynamic role in these transformations is unrecognized. Instead, technology and what it actually takes to reorder space and time are backgrounded as the critical analysis jumps directly to social effects and consequences (Coopmans, 2006). To prevent this from happening, Kirsch (1995) advocates more fully investigating the active performance of technology in such spatiotemporal processes so as to avoid macro-biased perspectives and the treating of technology as a "black box," diminished to a mere facilitator of the social production of space. This takes us to the third and final perspective introduced, as well as embraced, by Graham (1998): the recombination perspective that builds on ANT. By means of the recombination perspective, Graham extends the relational view in the co-evolution perspective on the shaping of electronic and physical spatiotempo-

ralities to also include investigating how relations between the social and the technical as heterogeneous sociotechnical networks are intertwined with (re)configurations of space and time. Graham (1998: 167) accordingly writes, drawing on ANT theorists such as Madeleine Akrich (1992), Michel Callon (1986, 1991), and Bruno Latour (1993a), that the recombination perspective denotes how “a fully relational view of the relations between technology, time, space and social life is necessary.”

However, turning to ANT does not mean the possibility of simply adding a relational view on how the social and the technical are always entangled to form various assemblages. Instead, it also entails embracing a certain relational understanding of space and time. This takes us back to ANT’s perhaps most central concept, namely, that of “translation.” Latour (1987: 117) writes that translation means a form of displacement linguistically as well as geometrically, moving you from one place to another. Translations always take one somewhere else, as they create “convergences and homologies by relating things that were previously different” (Callon, 1980: 211). As described in the previous section on ANT, through acts of successful translation, entities are displaced as they are repositioned by being drawn into the patterning of the network, or similarly, pushed away. Heterogeneous elements such as humans and nonhumans are associated in new ways as they are aligned with the chains of translations composing the assemblages. If these chains are made to endure in time and grow in length, the network is extended and can connect and spread to other spaces. As Jonathan Murdoch (1998: 360) writes, building on Latour (1987, 1990), this means that networks pleat and fold space-time by means of the mobilizations, accumulations, and recombinations that link humans, nonhumans, domains, and locales and gather places and times within a common frame of reference. In this network space, distance as a matter of relations takes precedence over distance as a matter of metrics as it is argued that “[s]pace, albeit partly physical is ... wholly relational” (Murdoch, 1998: 361). In what can be read as a comment on the preoccupation with the self-evident benefits of digital connections running through many policy discussions, Allen (2011: 289) writes that emphasis should shift from the existence and extension of connections to their substance, whereby “the length ... of connections matters less than the way in which things are connected.” In the words of Annemarie Mol and John Law (1994: 650), space becomes “[a] question of the network elements and the way they hang together. Places with a similar set of elements and similar relations between them are close to one another, and those with different elements or relations are far apart.” This relational “geography of heterogeneous associations” (Murdoch, 1997) is not so much about understanding the

meaning of space and time (as perhaps is the interest of some philosophers) as studying the work, practices, and artifacts involved in acts of spacing and timing (Bingham and Thrift, 2000: 290; Latour, 1988: 11).

5.4 The Immutable Mobile, Action at a Distance, and Technospatialities

ANT has today been taken up by many scholars in the field of human geography for a range of spatiotemporal analyses, combining insights from both areas (Bingham, 1996; Murdoch, 1997; Thrift, 1996; Whatmore, 1997). The origin of ANT's geographical dimensions is strongly associated with two central ANT concepts, namely, those of "inscription" and, most importantly, the related idea of the "immutable mobile." The significance of these concepts in ANT cannot be overstated and they have even been claimed to denote its origin (Law and Mol, 2001: 611). They are of great relevance here because they provide an analytical framework to draw on in understanding how (digital) data can be made to represent and speak for individuals, be they taxpayers, populations, or patients, in their physical absence—that is, how to enable "action at a distance" (Latour, 1987). Latour has defined inscriptions and immutable mobiles as follows:

Inscription: A general term that refers to all types of transformations through which an entity becomes materialized into a sign, an archive, a document, a piece of paper, a trace. Usually but not always inscriptions are two-dimensional, super imposable, and combinable. They are always mobile, that is, they allow new translations and articulations while keeping some type of relations intact. Hence they are also called "immutable mobiles," a term that *focuses on the movement of displacement* and the contradictory requirements of the task. (Latour, 1999: 306–7, italics added)

The term "immutable mobile" is fairly self-explanatory, signifying mobility without deformation. It indicates that the inscription retains its significant attributes as it moves between sites. For this to happen, the inscription must hold together its contained relations so that it keeps its object integrity in terms of relations, and when it arrives at its destination, this site must in turn be configured in such a way that the inscription's status is retained (Law and Mol, 2001: 611). Notably, a dialectics operates between networks. First, the inscription in itself is a network of relations materialized into a sign, which then travels across another network that should sustain and preserve the relations contained in the sign as it moves between sites. For example, in the case of the archive mentioned by Latour in the above quotation, a well-sorted archive that is reshuffled during transport can lose its cogency. Similarly, if

the recipient at the destination does not know how to read the archive, it is hardly of any use to the recipient. Standards and standardization are very useful in this, as they serve to guarantee that things are used and managed the same way between locations and situations.

Well-designed inscriptions turn losses into gains, in the sense that the locality and particularity of some real event is substituted, translated into a distilled form (e.g., archives, images, and numbers), allowing for increased combinability, durability (as in immutability), and mobility (Cooper, 1992: 257). That is, inscriptions enable the abstraction of localized and situated knowledge by translating it into a generic form that facilitates circulation and outlook (Quattrone and Hopper, 2005: 742). Thus, inscriptions allow for the establishment of “centers of calculation” (e.g., laboratories, census offices, clinics, and management suites) that serve to draw distant phenomena together into new configurations and can delegate knowledge/power relations to stable entities for further dissemination beyond the present. Successful immutable mobiles allow the network to be extended to new sites and facilitate predictable, ordered, coordinated, and repeatable “action at a distance,” influencing emerging peripheries both spatially and chronologically (Latour, 1987: 232).

The possibilities offered by designing immutable mobiles that make the content and use of information possible to standardize, control, and coordinate between sites is arguably the ultimate dream of policymakers and managers. As we saw in the previous delineation of eHealth policy and social scientists’ criticism of it, today’s health information situation can be depicted as instead the opposite, as being immutably *immobile* (Koch, 2004: 175; Law and Mol, 2001: 619). Health information is said to be locked up in “silos” and unable to travel between regions, nations, and healthcare institutions, failing to deliver the understood benefits of, for example, speed, coordination, aggregation, and combinability. Immutable mobiles could be seen as the antidote to these failures. Accordingly, as Moser and Law (2006: 62) claim, ICT visions in the healthcare field very much aspire to achieve immutable mobility, which is expected to result in information flow and seamless integration, the implication being that “information needs to be context-independent. It needs to be usable and re-usable, putatively staying the same and holding steady in a range of different contexts that include patient care, planning, research, and financial management.”

This projected seamlessness and context independence is predicted to create possibilities to make new connections between medical/care practices and planning/economics. It is generally expected to provide novel techniques for governmental organizations to influence healthcare professionals’ practices

and work routines remotely. Building on Foucault's notion of governmentality in line with what May et al. (2006) call technogovernance, and in combination with a Latourian understanding of "action at a distance," Rose and Miller (1990) have labeled these techniques for influencing absent others "governing at a distance". In the context of ICT-based healthcare, this may entail enlisting healthcare personnel in activities for the computerized gathering of information for transfer to healthcare organizational commands, increasing their visibility and scope for action. Importantly, the engagement of on-the-floor staff in these processes should simultaneously and preferably channel their attention in new directions, for example, by increasing their awareness of the necessity to improve efficiency in a situation defined by finite resources and, accordingly, affecting their decision-making in line with management aims (Bloomfield, 1991). As we have seen, such acts of governing at a distance by means of health information accumulation increasingly also apply to patients, who are supposed to engage in self-care through, for example, telemonitoring. Whereas they should be motivated to do so in order to improve their health, governing at a distance simultaneously means that they should accept increased individual and societal responsibilities, helping healthcare organizations increase their efficiency.

Taken together, the conception of information delineated here is very close to Mort, Finch, and May's (2009: 10) description of an eHealth policy discourse that envisions "a global seamless future" in which medicine is conflated with information and then translated into "flow, transmission and mobility." Scholars informed by ANT have argued that such rhetoric effectively hides all the situated and complex work that goes into accomplishing the effects of immutable mobility, i.e., making information keep its shape as it travels so it is usable at its destination. This argument has been presented in detail by Marc Berg and Els Goorman (1999) in their critique of those within the field of medical informatics who believe that if IT connections are in place, information will automatically travel freely and be successfully used at the point of access, including for "secondary purposes" such as financial management and administration. Instead, they argue that information is always bound up with the context of its production, which, in today's medical and care setting, comprises heterogeneous and complex networks of instruments, patients, graphs, notes, verbal communication, computer software, body fluids, etc. Translating the outcome of this process into useable information requires more than simply accessing the information. To make sense of these activities, one must also be able to relate them to their frame of reference, for example, clinical work. Accordingly, and building on ANT, Berg and Goorman (1999: 51) summarize their argument as follows in their "law

of medical information”: “the further information has to be able to circulate (i.e. the more diverse contexts it has to be usable in) the more work is required to disentangle the information from its context of production.”

Importantly, the work of disentangling information from its context to achieve mobility involves translation. As Latour (1999: 306) wrote in the above definition of inscriptions, “[t]hey are always mobile, that is, they allow new translations and articulations while keeping some type of relations intact.” An instance of this translation process was investigated by Mort, May, and Finch (2003) in their previously mentioned study of dermatology practiced via telemedicine. They argue that this project was underpinned by the ideas of action at a distance and the immutable mobile—although, as it turned out, in oversimplified versions. Due to structural problems concerning waiting times, dermatologists were to refer the initial patient consultation to nurses who, in the physical absence of patients from dermatologists, would forward digital images of skin lesions together with pro forma histories. “The real events” of touching, seeing, and talking to patients to read their emotional states were accordingly replaced by digital information made visible to physicians on their computer screens. Mort and her coauthors describe the process as a matter of the fragmentation of both patients and medical practice in that it greatly reduced the dermatologists’ role to one of spot diagnosis by digital images. This depiction of the situation was also confirmed by the dermatologists. It turned out that the distance created between patients/nurses and dermatologists due to the use of ICT had to be filled with additional and compensatory information in order for the dermatologist to consider the situation satisfactory according to their clinical standards. As I described elsewhere, much of this additional and compensatory work was carried out by the nurses, who had to take on more tasks than initially anticipated and invent creative ways of working with the pro forma protocol to meet the information demands of the dermatologists. The dermatologists were often still unconvinced that the gathered and digitalized information was sufficient for medical decision-making, and instead asked to see the patients face-to-face. The chain of translations broke apart as the relations deemed necessary by the dermatologists were not understood to be properly preserved when the nurses converted the patients into digital traces for transmission to the clinic for remote medical decision-making. Accordingly, this new way of organizing clinical work by telemedicine, motivated by a desire to reduce waiting times, impinged on the process of medical knowledge production to the point that the project was ultimately not considered economically feasible, as the doctors so often insisted on meeting their patients in person.

A paper by Oudshoorn (2009), while not drawing on the concept of the immutable mobile but informed by a relational understanding of the sociotechnical and the spatiotemporal, can, however, serve as a contrast. Oudshoorn compares face-to-face and telemonitoring services for patients with chronic heart failure (CHF). Rather than delineating the comparison as a matter of one service being carried out in physical co-presence and the other at a distance, as in the case presented by Mort, May, and Finch (2003), she understands that both services subscribe to proximity, albeit in different ways. By doing so, she can focus on how the two services create and value different forms of care rather than on what gets lost in moving from meeting the patients face-to-face at the clinic to interacting with them through telemonitoring. Importantly, Oudshoorn does not argue simplistically against “cold technology” and in favor of “warm care” (see Pols, 2012; Pols and Moser, 2009). Instead, she recognizes that both versions involve complex and heterogeneous practices, drawing on a range of forms of information, materials, and systems to make decisions, though differently configured due to how they work through contrasting versions of proximity. She argues that the face-to-face service works through “physical proximity,” which refers to “a nearness within which nurses physically touch and care for patients’ bodies” (Malone, 2003: 2318). This proximity is defined by how it promotes personalized care by supporting open communication and involving partners and close ones. Nurses take responsibility for monitoring, supervision, and treatment during the intermittent visits to the clinic. The telemonitoring service, on the other hand, operates through “digital proximity,” i.e., a proximity mediated by ICT. This digital proximity is characterized as individualistic, not necessarily involving family members but focusing on providing tools for patients to take responsibility for self-care; in this proximity, communication between patients and nurses is guided by protocols and daily monitoring for immediate ICT-mediated care.

Proximity is argued to exist in both cases, but the particular form it takes emerges out of how the network is patterned, centering on some things, shifting others toward the periphery, and generating new and novel connections. Proximity, therefore, does not disappear due to the physical absence in telemonitoring, but is reconfigured in relation to changes in what denotes appropriate CHF care. Oudshoorn (2009) even argues that the telemonitoring service and its interrelated proximity construct CHF so differently that the two services ultimately create two distinct versions of CHF. The two parallel existing networks shape two different forms of CHF as they differ in their composition of priorities and what to emphasize.

However, though the above STS research examined the work and transformations resulting from actors' attempts to use ICT to fold space and distance, other STS studies have chosen a different spatial path. Accordingly, some STS work is more interested in investigating the production of space and how such processes are intertwined with the configuration of sociotechnical assemblages beyond the aim of achieving action at a distance. Oudshoorn (2012), for example, has described how patients' use of a mobile telecare device for electrocardiography (ECG) monitoring can redefine their experience of public spaces. She noted that the device she studied was designed to emit a very sharp and high-pitched sound when a recording took place. Many patients felt that the beeping sound attracted the attention of nearby people, making them feel stigmatized. They hesitated to use the device in public, knowing that by touching the wrong button they might unintentionally initiate an ECG recording, or they might be mandated to carry out ECG measurements when visiting shopping malls or travelling on public transport. To prevent embarrassing situations of this kind, they developed various strategies to avoid public spaces when carrying the device. Thus, the device reconfigured patients' relations to public spaces, transforming them into "scary spaces."

The opposite can also occur: unlike how the mobile monitoring device restructured space, spatial relations can structure the introduction of a new service. This allows us to return to Dyb and Halford's (2009) telemedicine study in northern Norway, which examined midwives on the Lofoten Islands and their option of transmitting real-time fetal images to obstetricians at a mainland hospital. Their main argument is that, whereas telemedicine was supposed to render space and distance insignificant by exploiting the possibilities afforded by virtualization, spatial processes in fact came to shape telemedicine, reducing it to something rarely used. They illustrate how the virtually transmitted fetal images did not produce unambiguous facts based on which the remote obstetricians could act; instead, these images remained embedded in their site of production, at a particular *place*. First, the images needed additional support, for example, a sense of touch, that could be provided only by the midwife *in situ*, as found by Mort, May, and Finch (2003) in their dermatology study. Second, due to the small size of the local community, the midwives often knew the expectant women and were familiar with the earlier development of their pregnancies and knew what to expect, reducing their need to use telemedicine to consult obstetricians in cases of unexpected complications. In addition, a politics of place affected their use of telemedicine. The healthcare professionals on these remote islands prided themselves on their self-sufficiency, on how the local hospital and communi-

ty survived despite harsh conditions, leading to reluctance to obtain outside advice as offered by the telemedicine program. The location therefore shaped the telemedicine service into something understood by the midwives as rather unnecessary and useless.

However, Dyb and Halford's (2009) emphasis on this rural community when investigating the outcome of introducing an innovation leads us to a general argument against ANT, one that also involves the immutable mobile and entails exploring yet another form of spatiality. Informing this thesis at hand this argument takes us beyond the previous discussions of telehealthcare. In emphasizing the importance of place, Dyb and Halford implicitly align themselves with a line of criticism that has been directed towards ANT for being too focused on how the center, in a managerialist fashion, successfully strives to configure the periphery according to its controlling ambitions, and hence not on the consequences and implications this may have for those on the periphery. Accordingly, some conceive of ANT scholars as describing human actors as sinister manipulators with the ambition to dominate others, forcing them to comply with their rules. As Law (1992) has remarked, Machiavelli's *The Prince* has indeed influenced ANT work (see, e.g., Latour, 1987). Susan Leigh Star (1991) has argued from a feminist perspective that this has resulted in a tendency to center on, for example, the white, male executive, building his "mini empire" while excluding poor women of color, often positioned in a peripheral existence. This criticism, voiced by Star and others, has become part of an argument claiming that ANT has too often been used in ways that overemphasize the establishment of order and stable relations. Ingunn Moser and John Law (2006) write that, in its most functionalistic version, ANT has even become caught up in ICT programs themselves to justify optimistic technological scenarios, for example, in relation to the goal of establishing immutable mobiles. ANT scholars have therefore increasingly become interested in possibilities other than establishing fixed and invariable relations to accomplish coherent alignment.

5.5 The Geographies of Regions, Networks, and Fluids

A case in point is Marianne de Laet and Annemarie Mol's (2000) seminal study of the Zimbabwe bush pump, which the authors claim is not a technology comprising fixed relationships but is instead a fluid technology as it is not too rigidly bounded, does not impose itself but tries to serve, and is adaptable, flexible, and responsive (2000: 226). Law (2009: 153) has described this pump as a *mutable* mobile because, unlike the immutable mobile,

its success is defined by how it changes shape when it travels around Zimbabwe. Bits and pieces fall off and are not always replaced with the same ones, but with whatever is suitable and at hand in the villages where the pumps are used. Not only does the pump change shape, but its workability is also fluid. As de Laet and Mol (2000) note, the pump might succeed in providing water but not health, as the water that comes up is sometimes contaminated. On the other hand, rare lab analyses of water samples sometimes indicate that the water has an excessive concentration of bacteria, but still the villagers are well. There is no clear-cut answer as to whether or not the pump works. The pump is defined not just by these varying boundaries; it is also a device that is supposed to build communities that gather around it to ensure that the pump keeps working. It is simultaneously also a nation-building apparatus involved in building a Zimbabwean healthy water infrastructure for the populace. However, it is still the Zimbabwe bush pump; it is not a bucket pump. de Laet and Mol (2000, p. 253) conclude by arguing that the pump has succeeded precisely because it is fluid, because it can accommodate multiple and changing variants of its environment. Had the technology been too rigid and fixed, it would not have succeeded and its use would not have spread across Zimbabwe.

This argument also contains a spatial implication that had already begun to emerge when I introduced the immutable mobile concept. More than simply facilitating action at a distance, the immutable mobile can, as Law (2002: 95) explains, also be understood as an accomplishment of linking two different spatial systems. Law argues that the immutable mobile works by moving through regional space (also known as absolute or Euclidian space). What keeps the immutable mobile together belongs to another type of spatiality, i.e., the network space in which, as I described elsewhere, proximity is not defined by metrics but by how close entities are to each other relationally. While the immutable mobile moves in Euclidian space (i.e., between regions and areas) it does not move at all in network space (i.e., its relations stay fixed), and this, explain Law and Mol (2001: 612), is the special feature of the immutable mobile: it achieves its characteristics by participating in both spatial systems whereby it elides the two. Law (2002; see also Law, 1986) cites how the Portuguese expanded their area of naval domination in the fifteen and sixteenth centuries, for example, securing a stranglehold on the Indian Ocean that had previously been monopolized by Muslim sailors. He argues that Portuguese shipbuilding and seafaring achievements and knowledge of naval warfare can, in ANT terms, be understood as a heterogeneous network constituted of (to mention just a few entities) wood, navigational instruments, well-drilled sailors, maps, cannons, and accumulated

knowledge of winds and currents. It was not until the Portuguese were able to connect and fix all these relations into a stable entity that they could safely sail from Portugal to India and open a new trade route to exploit. To Law, this denotes the creation of an immutable mobile. It is mobile because the ship travels between Portugal and India. It is immutable because the ship, in itself a network, holds together as an object of relations (including hull, spars, sailors, food, and guns to protect it from attack) and likewise does not get lost at sea because it can rely on a network that secures its route using maps, the collected knowledge of currents and friendly waters, etc. The ship therefore holds together in both Euclidian and network space, orthogonally and as a volume in Euclidian space as a set of three-dimensional coordinates, and functionally in network space (Law, 2002: 95).

With the introduction of the mutable mobile we are, however, presented with yet another spatial possibility, that of fluid space. As we saw in the case of the Zimbabwe bush pump, this pump can change both its appearance as a volume by how its components are continually replaced and its relations to its surroundings as it moves between places and situations. The objects that inhabit this space are objects that change shape in both Euclidian and network space while, simultaneously, being able to retain their identity (Law and Singleton, 2005: 338). Furthermore, in fluid space, objects whose relations are too frozen and too fixed are the ones that break apart. Fluid space, then, is dominated by loosely associated relations. Mol and Law (1994: 641) write that this is a space where “places are neither delineated by boundaries, nor linked through stable relations: instead, entities may be similar and dissimilar at different locations within fluid space. In addition, they may transform themselves without creating difference.”

Fluid space embodies “an alternative politics of object-constancy that does not link functionality to centering, syntactical stability or capitalization” (Law, 2002: 103). As such, fluid space affords new possibilities beyond those of coherence, alignment, order, and control that have been claimed to characterize network space and the immutable mobile and should therefore be understood as a response to the criticisms leveled by Star (1991) and others. However, as Murdoch (2006) points out, multiple spatial formations often blend, intersect, or interfere with one another in complex ways, and objects become the outcomes of their various spatial configurations, as the objects also come to perform multiple spaces. As Murdoch (2006) argues, the existence of multiple formalized networks can sometimes create fluidity if these networks are not well coordinated; on other occasions, more ordered network spaces fight off unstable moving space as there also exist instances in which attempts are made to exploit and incorporate flux and fluidity into standard-

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ized network spaces. The analytical issue then becomes one of tracing the various spatial formations, which is equivalent to tracing power relations. This is because “whoever succeeds in defining the order of priorities succeeds in determining the connections which give rise to the spatialities and temporalities that compose our world” (Murdoch, 1998: 370).

6

The Theoretical Resources Employed

In the above pages I have advocated the usefulness of building on STS in studying the ICT-facilitated emergence of eHealth and healthcare at a distance. I began by examining the sociology of science as represented by SSK and then its counterpart in technology studies, SCOT. Both perspectives have made major contributions to understanding science and technology as constituted by social processes, the latter in an effort to battle technological determinism, emphasizing that technology does not have intrinsic properties (Pinch and Bijker, 1984). However, by pursuing ANT, I have argued that science and technology also actively mediate, and thus shape, the social (Callon, 1987; Latour, 1987; Law, 1986). Building on ANT, I described in detail how deeply intertwined technomedical practices and sociopolitical dimensions are: shaping each other, they can hardly be separated. Specifying important theoretical aspects of ANT, I demonstrated how these intertwine-ments should be studied in a relational manner as sociotechnical networks. I then set out to introduce how STS and ANT have informed the study of telemedicine and telecare, allowing this work to account for the many complexities involved in attempting to introduce telemedicine and telecare. The roll-out of ready-made technology connecting already aligned actors was replaced with processes of negotiation (Berg, 2001: 154; Langstrup, 2008: 125), the repositioning and reconfiguration of both humans and nonhumans into new heterogeneous constellations being a requirement for the working of telemedicine and telecare. Sometimes these processes were initiated intentionally, but perhaps more often they began without having been predicted or accounted for, putting considerable responsibility on medical and caring staff as well as involving patients and the elderly in exploring and working out how to make the most of the new circumstances.

I then extended the study of sociotechnical assemblages into the spatio-temporal domain by building on three perspectives on the relationship be-

tween ICT and geography described by Graham (1998). I began by arguing that the eHealth policies of the WHO and the EU corresponded well with the techno-determinism of the substitution and transcendence perspective, as they are largely centered on the existence and extent of digital connections. According to this view, if computers are provided and a telecommunication infrastructure is built, automatically, sites and regions will be successfully connected across time and space, online communication will flourish, and information will flow, eliminating the friction of distance. This was followed by a presentation of the co-evolution perspective and how it, as opposed to the substitution and transcendence perspective, asks us to be wary of depictions of technology as having inherent spatiotemporal positives. Discussing previous social science work on telehealthcare with a geographical focus, which, I argued could be placed within the co-evolution perspective, I cited examples of the ambiguous politics involved and how virtual geographies are neither outside nor parallel to the physical realm. By doing so, I illustrated how the co-evolution perspective brings to light how electronic and territorial spaces are always jointly and socially produced and always benefit some actors more than others.

However, I have further argued that in its effort to counteract technological determinism by emphasizing instead the *social* production of space, the co-evolution perspective risks failing to adequately address the role of technology. In this regard, it is very similar to two related approaches to technology studies, i.e., the social shaping of technology and SCOT. The third position, the recombination perspective derived from ANT, serves to fully include the dynamics of technology in the spatial analysis. Attention is focused on how ICT and its geographies are always constituted by heterogeneous human and nonhuman assemblages—institutions, artifacts, practices, professional groups, social arrangements, etc.—which have to be enrolled and related in such a way that some form of functioning social order is produced (Boczkowski and Lievrouw, 2008; Graham, 1998: 178). In outlining the ANT concept of immutable mobiles, I illustrated how it was developed to explain the creation of functional social order by establishing stable relations allowing “action at a distance” (Latour, 1987). Moreover, I highlighted how achieving immutable mobility involves considerable work, as series of translations are required for real events to be replaced by inscriptions. These efforts are overlooked in functionalistic accounts of the supposedly self-explanatory power of ICT and digital information (Moser and Law, 2006).

According to an analysis relying on ANT concepts, ICT does not “erase” space. Instead, the possibility of folding distance should be understood as an effect of successful network building, in line with the way the Portuguese

managed to connect a heterogeneous set of elements to traverse the distance to India (Law, 1986). Using ICT to govern medicine and perform care “at a distance” is therefore much more appropriately depicted as entailing the reconfiguration, reworking, and reinterpretation of healthcare practices and work routines than by recurrent eHealth policy concepts such as seamlessness, flow, and transmission (Mort and Smith, 2009).

Furthermore, I discussed how STS scholars have moved beyond studies of accomplishing action at a distance by the introduction of telehealthcare services, not only addressing the way telehealthcare can fold space, to analyzing the emerging spatialities produced by the new services. Oudshoorn (2012), for example, has illustrated how mobile telemonitoring devices transform patient experiences of public spaces, making them into scary spaces. The opposite situation has been investigated by Dyb and Halford (2009), who describe how spatialities can be drawn together in ways that determine the outcome of telehealthcare services.

However, the concepts of action at a distance and immutable mobiles, and the ways they have been applied by scholars drawing on ANT, have been criticized for focusing too much on successful efforts of the center to exercise control at a distance in a colonizing manner, while paying insufficient attention to what this might imply for the periphery. In response to such criticisms, I elaborated on the concept of mutable mobiles (Law, 2009; Law and Mol, 2001). This concept has been developed to emphasize the existence of more fluid and loosely coupled relations. Rather than setting in place a well-defined network of relations enabling predictable and repeatable effects across space, recognizing fluid relations arguably allows us to address variation across locations and situations. Although such relations might create tensions due to their “unreliability,” they also enable alternative modes of endurance beyond those of order, coherence, and alignment, which are characteristic of immutable mobiles. Sometimes this has been framed through a geographical lens as the difference between network space as defined by rigid and fixed relations and fluid space as defined by changing and flexible relations (Law, 2002; Mol and Law, 1994).

6.1 Aim and Research Questions

The overall aim of this thesis is to contribute to our understanding of new services providing healthcare at a distance, by charting the emerging landscape of telehealthcare and exploring how sociotechnical assemblages are intertwined with spatiotemporal formations in new geographies of healthcare.

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A range of empirical issues is investigated in the four constituent papers of the thesis, whose orientations partly diverge. In the thesis as a whole, however, three general research questions have been given priority:

1. How does the introduction of services providing healthcare at a distance affect the constitution of healthcare: its organization, practices, and routines?
2. How do these innovations affect the formation of spatial and temporal relations?
3. What relations between contrasting rationales, aspirations, and usages are manifested in the initiatives constituting this emerging landscape?

While the theoretical and empirical basis of questions 1 and 2 has been explicated above, the methodological issues touched on in answering question 3 will be addressed in the sections to follow.

7

On Method

The analysis of telehealthcare offered here is based solely on published textual sources such as policy papers, project overviews, scientific articles, evaluation reports, and accounts by science journalists. In this regard, my approach differs from STS research based on ethnographic fieldwork, including many of the telehealthcare studies discussed above. As Hine (2007: 658) writes, “[w]hilst clearly not the only method used within STS, ethnography does have a special place in its heart.” This has been the case ever since science studies scholars started using ethnography in the 1970s to explore what was going on inside scientific laboratories (see, e.g., Latour and Woolgar, 1979; Knorr-Cetina, 1981; Lynch, 1985).

In this section I will explain why I considered document analysis, rather than ethnography, the appropriate method. Document analysis and ethnography are not mutually exclusive: ethnography, in an almost colonizing manner, is often combined with numerous other qualitative approaches, including document analysis. Hess (2001: 239), for example, argues that carrying out “good” ethnography within STS today means deploying an array of qualitative techniques. Among the approaches and activities he enumerates are: visiting conferences; working in laboratories; attending virtual chat rooms and real-world colloquia; interviewing a wide range of people, including those associated with the “community” but also “outsiders”; becoming engaged in activist and social movement organizations; *as well as* reading a vast amount of technical literature and making use of archives.

However, while there are many perceptions of what ethnographic field work may entail, its defining core is commonly taken to be “first-hand experience and exploration of a particular social or cultural setting” through documented observation and participation (Atkinson et al., 2001: 4). This is very different from my approach of relying exclusively on published documents. The approach chosen for this thesis, as I will suggest below, offers a different field of investigation, enabling me to identify some interesting contrasts not

otherwise visible. This contrast between analyzing published material and relying on first-hand witnessing and face-to-face interaction *in situ* will be followed by a discussion of the comparative dimension of my work, which, I believe, can be framed through a geographical lens.

7.1 Ethnography and the Use of Documents

To many of the scholars in the first generation of science studies emerging in the 1970s, the ethnographic method appeared to offer the right means to fulfill their desire to investigate scientific practice as it happened within laboratory confines, so a branch of STS labeled “laboratory studies” evolved (Knorr-Cetina, 1995). The ethnographic techniques of ocular observation and interaction enabled the study of knowledge production “in-the-making,” documenting how the “manipulation of the empirical,” i.e., the hard core of science, was permeated by social and cultural processes (Beaulieu, 2010: 454). Since then, the use of the ethnographic method in STS has moved outside laboratories to include investigations of innovation (Latour, 1996), medical practices (Mol, 2002), as well as technology-in-use and design (Woolgar, 1991) “in action.” Often this has meant investigating scientific and medical knowledge claims at a stage before they become well-established facts, and technological innovations at a stage preceding their being “blackboxed” (Timmermans and Berg, 2003: 103–4). In this regard, ethnography has been extremely helpful, allowing studies of informal and tacit phenomena and procedures as they take place in their ongoing moments. Through attendance, observation, and interaction with informants, STS researchers have, for example, demonstrated the contingent, non-coherent, and messy nature of increasingly technology-mediated healthcare work. Doing so, these scholars have challenged rationalist accounts of healthcare as proceeding in an instrumental and prestructured way (Berg, 1999).

However, this thesis has not been driven by the objective of displaying the *ad hoc*, unveiling the covert, or disclosing the messy, key themes of many STS ethnographies, but rather by the intention to trace how telehealthcare is made to make sense. My aim is close to what Moser and Law (2006: 57), in a general comment on STS, have described as an interest in studying a multitude of “logics, rationales, discourses or strategies that are taken to underpin, be carried in, and reproduced by materially heterogeneous networks, organisations, structures or practices.” My aspiration has been to study wider sets of questions concerning how telehealthcare and its geographies are justified and deemed appropriate, reasonable, and preferable by policymakers, practition-

ers, and developers. I have, for example, asked myself what telehealthcare is to them; why they want to use it; how they believe it should be used; and how using it comes to variously define healthcare, its provision, delivery, and availability. To accomplish this, I have understood telehealthcare as an evolving and changing heterogeneous landscape to be traced in multiple directions, sites, and situations. Taken together, the papers collected here cover decades of telehealthcare developments and describe numerous telemedicine and telecare projects across the globe. Thereby, it has been possible to investigate the plurality of ways in which the practices and logics of medicine and care are intertwined with the various discourses and rationales of policy and governance.

In light of this, the benefits of ethnography as defined by the possibilities it offers for exploration and experience through first-hand observation and participation in particular settings mean little. There are several reasons for this. First, the historic dimension is important to this thesis. Second, comparing and contrasting coexisting services and initiatives has been an important dimension of my work. It bears noting that the possibility of carrying out investigations at several locations in parallel has been discussed extensively by ethnographers, and recently the methodological canon of conventional ethnography has been challenged by the advocacy of multi-site ethnography (Hine, 2007). Third, as Lehoux (2004: 640) points out, local, fine-grained analysis can easily make one lose sight of the broader political terrain, which frequently extends beyond the locally selected field site(s). In sum, a conventional ethnographic study would have entailed considerable difficulties serving the purpose of this thesis, as it has considerable trouble traversing space and time.

This is why published textual sources, affording mobility in space and time (Hodder, 2000: 703), have proved so useful to me. First, texts preserve a particular moment, enabling analysts to move back through time. Second, analysis of accounts from multiple projects carried out at different sites, appearing, for example, in dedicated academic journals, affords an overview of activities taking place at various locations, so that the degree to which they diverge or are aligned may be studied. Third, by complementing project reports with documents such as policy papers and similar official documents, moving back and forth between them to trace associations, I have been able to keep track of the political ramifications and interrelations of government policies and care practices. Thus, documents can be made to serve very much as Ariadne's thread, allowing analysts to move with relative ease from the present to the past, between the local and the global, and between the regional and the national (Latour, 1993a: 121).

Generally, in STS, there are two very different ways of treating documents. The first approach is commonly found in ethnography, where relying on informants' written statements has often been regarded as contravening the commitment to witnessing and interacting, creating a barrier to the purportedly more reliable accounts gathered by ethnographic research carried out face-to-face (Beaulieu, 2010: 457–8). In STS, this standpoint has been clearly expressed through laboratory studies, for example (Knorr-Cetina, 1995: 155). Accordingly, one of Latour and Woolgar's (1986: 28) main arguments for studying scientific practice through ethnographic fieldwork was that "printed scientific communications systematically misrepresent the activity that gives rise to published reports," a statement they supported by referring to a classic article by Peter Medawar (1964).

The second approach, which this thesis applies, does not treat documents as distorted representations of reality that any serious analysis must move beyond. Instead, I agree with Prior (2008: 822), who, drawing on the ANT insight that things, too, can act, suggests that documents be considered "active agents in networks of action." Accordingly, he argues that, as researchers, we need to "examine how documents as vital objects can drive and shape political, economic, medical and scientific activities just as much as humans do" (2008: 833). Callon (1991: 136–7) similarly argues that texts should be understood as "sociotechnical dramas." In them, government agencies, experimental arrangements, artifacts, methods, humans, and many other entities are drawn together and grouped in authors' attempts to build, reorder, and disrupt relationships within as well as beyond the text. He suggests that texts should therefore be seen as having "neither an inside nor an outside." Rather than being considered "closed" units, texts should be regarded as networks attempting to create the worlds they describe (Callon, 1991: 136). In this approach it is argued, as Richie Nimmo (2011: 166) puts it, that "texts are not inadequate representations of lived practices which are always already absent in the text, but relational inscriptions embedded in hybrid networks which they help to assemble." In other words, the analytical task is not a matter of comprehending what is "outside" the text; rather, the point is to determine what relations are made in it and how they connect to wider sets of assemblages.

Therefore, if one wishes to study the emergence and mobilization of the associations constituting the telehealthcare landscape, how it is made to make sense and is justified, a good way to proceed is to trace and analyze published accounts and statements from the community of clinical champions, policy-makers, project managers, developers, etc. These documents and how they serve to organize relations between hardware, software, management, vi-

sions, space, time, patients, the elderly, professionals, finances, medical practice, etc., can be read as the inscribed materializations of the professional voices of telehealthcare with the authority to speak on this matter. In writing about telehealthcare, they define what it is, its role(s) and function(s), how it is to be publically displayed, what to foreground and what to make absent. Far from being abstract representations of an existing world, these texts intervene in the world and shape it by the way they bring things together (Callon, 2002).

7.2 Places, Trails, and Landscapes

As previously mentioned, ANT's methodological slogan is "following the actors" wherever they go (Latour, 2005: 12). The emphasis on "following" denotes a preoccupation with movement, as is highlighted by such concepts as action at a distance and the immutable mobile. Hence, ANT pays considerable attention to studying the translations made to cause inscriptions to circulate and networks to be extended, understood as means whereby power and knowledge are established and distributed. This process is often described as a matter of actors building an interlocking chain of associations to then be traced by the researcher (Cooper, 1992: 259; Latour, 1986, 1999: 73). However, the focus on mobility has also been met with a geographically formulated critique. This critique is relevant here because it connects to how all the constituent papers of this thesis share a comparative stance that is not so much about following a chain of associations from beginning to end as about what can be gained from comparing different chains.

Henke and Gieryn (2007: 355) have argued that ANT's interest in circulation and movement risk occluding "the apparent significance of the specific geographical spaces where the actants pass through or end up," whereby they contend that it fails to recognize the important significance of the relation between knowledge production and the places where this occurs. This kind of spatial critique has been taken up in some telehealthcare studies. Oudshoorn (2012) builds directly on Henke and Gieryn's (2007) emphasis on place when she advocates the need to attend to the specific practices, meanings, and experiences attributed to places such as the home in association with telecare. Drawing on human geography, she understands "home" not only as a place denoting a particular physical space but as a site of personal significance and imbued with historical and cultural connotations. She accordingly stresses the importance of investigating how the incorporation of telecare into individuals' residences transforms the relations between the home, its household

members, the new telecare services, and the clinic to which they are connected—in other words, how telecare affects and is affected by being incorporated into the home and the lives of those living there and how the spatial boundary between the home and the clinic is reconfigured into a new hybrid public/private space. This is something she claims is missed if, instead of investigating the specificities of the relations constituting the places where technology is used, one follows ANT's emphasis on studying the flow of actants through the network, whereby places are treated very much as abstract nodes. A similar argument is developed by Dyb and Halford (2009) in their ANT-based study of the introduction of telemedicine in a rural part of Norway, in which they argue that the fate of this service can only be understood through the lens of place. In studying the relationship between technology and place, however, they found that ANT's concentration on how technology moves through space limited the possibilities for capturing the dimension of place. Therefore they too chose to complement ANT with the sensibility of place developed within human geography, making them suggest place to be a point of intersection between objects, relations, and processes across as well as beyond the local.

This place-based criticism, which I believe is valid, can also be pursued from another direction. In adhering to the methodological mantra of "following the actors," the researcher's task according to Latour (2005: 9) becomes one of behaving like an ant using its antennae to sniff out the heterogeneous trail of entities linked together, going from node to node—that is, assuming the task of looking down, to "[b]e even more blind, even more narrow ... even more myopic" (Latour, 2002: 124). Murdoch (2006: 97), however, being unsatisfied with a geographical analysis very much limited to observing what is linked to what and assessing how power flows in and out between the center and periphery, instead advises us, by building on the work of philosophers Serres and Deleuze, to seek a "vantage point" and not just study single networks. By doing so, he claims it will be possible to gain a vantage point from which to observe not just one network trail, but a multitude of networks and scattered assemblages running in parallel and overlapping, creating tensions as well as clashing. This move can help the researcher escape a too narrow focus on following a single path of translations, causing the researcher to overlook other routes and alternative branches. As Law (1991: 11) warns us, closely following the actor entails the danger of losing one's critical distance, accepting the actors' understanding of their worlds and of what is and is not important. To prevent this from happening, Law draws our attention to the method of comparison as an antidote that makes it possible to see things from different perspectives.

In writing the constituent papers of this thesis, I wanted to put myself in a vantage point from which to attain an overview of telehealthcare, understood as a mesh of networks in line with a view of what I have described in geographical terms as a “landscape.” This methodological take has allowed me to work through comparison and contrast, avoiding staying narrowly within a single network frame or being overly centered on/fixed to a particular place. Instead, I have crisscrossed between networks to reveal defining and significant features of the emerging landscape.

The technique of rendering things visible by comparison and contrast builds on a longstanding tradition in STS. Describing his “empirical programme of relativism,” Harry Collins (1981), argued that the relativism of scientific truth claims could be usefully exposed by sociologists through the study of scientific controversies (today an institutionalized approach in STS). Collins’ argument for focusing on controversies was that it allowed one to compare and contrast competing scientific claims and, by doing so, it was possible to demonstrate the “interpretative flexibility” of scientific truths. Similarly, Karin Knorr-Cetina (1999: 4) used the technique of “comparative optics” in developing her argument as to the existence of diverse epistemic cultures in the sciences by depicting the differences between the two prestigious fields of high-energy physics and molecular biology. In attempting to demonstrate that atherosclerosis is not a single entity, Annemarie Mol (2002: 53) likewise chose to work through the “point of contrast” as she attended to the ways atherosclerosis was enacted differently between wards, treatments, groups of patients, etc. By comparing and juxtaposing such differences, she could trace the coexistence of multiple versions of atherosclerosis.

Translated to this thesis, working through the lens of comparison and contrast has meant that in none of the four papers have I limited myself to, for example, examining just one site, one single situation, or one moment in time. On the contrary, I have drawn together various settings to explore their similarities and differences. This means that I have juxtaposed visions, applications, and projects as “sub-networks” that I have understood to be parts of a larger landscape of healthcare at a distance, analyzing their similarities, differences, and contradictions. By doing so, I could investigate how the status they attribute to telehealthcare always somehow differs, even though all these written accounts share an understanding of the importance of telehealthcare, for example, either carrying out projects or highlighting its importance in (trans)national policy documents. Their visions turn out to be somewhat disparate: technical setups shift between projects, care availability becomes different things, regional areas turn out not to be comparable, distances vary, etc. Even so, they all overlap enough to be part of the same governmental

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discourse or published in the same specialized journals. As Whitten and Collins (1997, p. 37) comment with reference to telemedicine, “amazingly, there is an identification across location with other programs that also call what they are doing ‘telemedicine’ even though they would all define what they are doing very differently,” some describing what they do as a new application of old technology, others as changed medical practice. Some visions of telemedicine emphasize the possibility of reaching out to those who have been outside medicine’s territory, while others see it as just a cheap substitute for physical transportation.

Here again my choice of method differs from that of the ethnographic field study, which frequently observes a phenomenon in action on site before it has become “blackboxed” and made the journey from messiness to tidiness. In contrast, my empirical material consists of many *already coherently ordered* realities gathered together from my office. However, if one places a corpus of documents containing preordered realities side by side on one’s desk, one often finds that, once read against each other, complexities start to emerge ubiquitously. By investigating how these orderings are generated both in an archaeological, diachronic manner and as coexisting as synchronic versions, I have sought to render visible their resonances and frictions, as discussed by Mol and Mesman (1996) regarding the existence of alternative orderings and the task of tracking them. This exploration with a simultaneous focus on homogeneity and heterogeneity has turned out to be one of the main pillars and, I believe, strengths of the thesis.

8

The Empirical Material

How, then, have I gathered my accounts of telehealthcare, of what do they consist, and how have I used them?

The first paper, entitled “(Re)Producing the Fetal Patient: Tele-Ultrasound and the Constitution of Obstetrical Knowledges,” discusses the use of telemedicine in monitoring pregnant women and fetuses. The initial impetus for this paper was an invitation to write a chapter for an edited collection on the topic of new technologies for visualizing the inside of the female body and its reproductive organs and related changes in medical knowledge production and learning processes. Accordingly, there were some pre-set topics to examine. To address these themes in an empirical manner vis-à-vis my interest in telemedicine and my coauthor’s interest in the fetal figure, we agreed to study the combination of telemedicine and fetal ultrasound. To capture aspects of medical knowledge production and learning processes, we decided to focus our attention on the scientific version of tele-ultrasound. Hence, the empirical material for this paper was collected by trawling various medical journals in fields such as telemedicine, obstetrics, gynecology, and ultrasound.

In gathering empirical material for this paper, I relied on the “snowball” technique, a technique for sampling informants used widely in STS (see, e.g., Pinch, 1981: 137, and Collins, 1992: 76, n. 4). Researchers often begin by interviewing a limited number of relevant actors identified through a preliminary literature review. At the end of each interview, researchers simply ask interviewees to suggest other informants who might be relevant interview subjects, to gain a comprehensive picture of the case. Initially, new names quickly accumulate, like a growing snowball rolled across fresh snow-covered ground but, after a certain point, saturation is reached in the sense that new names of potentially relevant informants rarely appear. Commonly used to identify informants for contemporaneous cases, the snowball approach can be useful in historical research as well, as Bijker has suggested

(1995: 46). Bijker used the technique when analyzing historical documents to identify “relevant social groups” (an important concept in the SCOT approach) involved in developing innovations. In my adaptation of the technique, I did not use it to identify either interviewees or relevant social groups; instead, I applied it as a useful tool for studying tele-ultrasonography by tracking the paths of citations between scientific papers discussing the topic, as described in the next section.

To gain a preliminary overview, I began by searching through Google Scholar, using combinations of search terms such as ICT, obstetrics, fetal/foetal, telemedicine, ultrasound, gynaecology/gynecology, ultrasonography, teleultrasonography/tele-ultrasonography, and telesonography. When I found a paper that looked promising based on its title, I continued to read the abstract to determine whether I should read the whole paper to decide whether to add it to my empirical data. In identified papers, I also searched references to other papers that I believed would be relevant based on their titles and, if they appeared promising, repeated the process of reading abstracts and possibly full-length papers. If a paper took me to a new journal, I started searching that journal too for supplementary papers, again reading titles and reiterating the above stages to identify new papers to add to my empirical material. In parallel, I also used Google Scholar’s citation function to trace papers citing the papers I had come across to see whether I would discover still more relevant papers. After the initial review, and tracking additional papers through references to other papers and journals, it soon became clear that the body of scholarly papers focusing on tele-ultrasonography for fetal monitoring was not very large. The process resulted in the collection of 20 papers published between 1995 and 2008 on various projects around the globe. All the papers had medical doctors as their main authors, and only rarely were other professional groups represented among the coauthors. As this was a manageable number of papers to analyze, we decided that no additional culling was warranted: any further elimination of papers might result in our missing important topics and aspects.

I then set out to read all the papers with an agnostic attitude toward their content but with the abovementioned themes in mind, looking for recurrent topics within and across the papers. In what follows, I will illustrate the process, because I have repeatedly relied on this way of analyzing my empirical material. I will moreover demonstrate a feature of my analysis mentioned in the method section above—my way of simultaneously focusing on homogeneity and heterogeneity in my papers.

The initial reading created a sense of unease as it was difficult for me to find things to study. In fact, it seemed that nothing particularly interesting was treated in the papers since they produced accounts of tele-ultrasonography that initially appeared both very similar and very logical. However, I then focused on rereading the papers “with” as well as “against the grain.” On one hand, I recognized the authors’ statements about what were important matters, and followed the actors’/authors’ way of establishing associations between women, machinery, medical practices, economics, fetuses, and all the rest. On the other hand, however, I attempted to disclose the implications of these arguments and assemblages by purposely adopting an interrogating approach to the texts. By doing so, it was possible to see the logic operating in a blackboxing, matter-of-fact manner within the papers, while simultaneously gaining insights into how they could be decoded.

Accordingly, arguments that first appeared logical ultimately led to some intriguing conclusions. One was that many of the projects advocated connecting ultrasonography with telemedicine because it could reduce the number of unnecessary hospital referrals. That is, the widespread use of ultrasonography to monitor pregnancies and identify possible anomalies was understood to have increased the number of pregnancies misinterpreted by untrained healthcare professionals as at-risk pregnancies requiring specialist attention. By using telemedicine to obtain an expert opinion on the ultrasound image at the first point of clinical contact, such as a primary care center, many expecting women who otherwise would have been wrongly forced to travel to see specialists could immediately be reassured as not needing further medical attention. This was said to save costs as well as reduce stress for pregnant women and their fetuses. However, by not only reading this line of argumentation “with the grain” (as explained and delineated by the authors’ rhetoric), but also “against the grain” (deliberately setting out to challenge the claims made), it was possible to resist getting caught up in the apparent inevitability of this biomedical rationale for adding telemedicine to ultrasonography. By following the logic through, we were instead able to reframe the straightforward argument as a more peculiar one: the main justification for linking telemedicine and ultrasonography turned out to be that it prevented the movement of women who, in fact, should never have to move in the first place, but who were increasingly forced to travel because of how remotely situated healthcare professionals frequently misinterpreted the ultrasonography images.

Parallel to the technique of reading “with” and “against the grain,” I also set out to do a comparative reading of the papers to see whether I could find any instances in which the rationale proposed in one paper was (unintention-

ally) questioned by rationales proposed in others. By doing so, I noted, for example, that whereas many projects invoked the same rationale, i.e., implementing fetal tele-ultrasonography in an effort to increase the efficiency and quality of care, their actual purposes could still differ significantly. Therefore, as described at the end of the methodological section, I found coexisting modes of order. For example, I began to notice that whereas one project would focus on the possibility of centralizing service at expert hubs, another would instead emphasize the possibility of dispersing expertise to a wider area. Whereas some projects saw the possibility of virtually referring more pregnancies to be investigated by highly skilled specialists, others focused on improving the capacity of low-skilled care workers to improve their medical judgment on site. My comparative approach allowed me to move behind the biomedical rationale articulated in any individual paper, questioning it through the lens of the various contrasting rationales proposed in other papers, providing new openings for the analysis. Matters that made considerable sense when reading one paper could, by purposefully contrasting that paper with others, be turned upside down as these other papers sometimes proved to work according to very different logics. Instead of the existence of just one overt, official rationale, there could be others that were less than fully aligned, or even, as in the above example, tending in the opposite direction.

While the empirical analysis conducted in the tele-ultrasonography paper concentrated on scientific aspects of the provision of services, the next two papers have a different focus which is regional. Taken together, they contain empirical material written by exclusively Swedish authors representing not only the medical profession but including policymakers and health economists. The materials on which these two papers are based partly overlap. Chronologically, the paper that is now number three in this thesis, "Medicine at a Distance in Sweden: Spatiotemporal Matters in Accomplishing Working Telemedicine," was drafted before all the other papers. Subsequently, I used some of the same data in paper number two, entitled "From Medicine by Wire to Governing Wireless: Changing Geographies of Healthcare." It is therefore useful to start by discussing paper number three.

Paper number three was my first attempt to make sense of my empirical field of investigation, which, at the outset of my project, I had loosely framed as "telemedicine." Of course, I had to start somewhere, but just entering, for example, the term "telemedicine" into an Internet browser turned out to produce an unmanageable abundance of hits. I realized that my gathering of empirical material needed some structure, so I initially chose to limit myself to Swedish developments. I also felt that this might offer me a cultural ad-

vantage in the highly competitive international arena of academic publishing, allowing me to establish a niche for myself by exploring the “Swedish case.”

I decided to start by conducting an inventory of Swedish material on telemedicine as indexed in PubMed. I carried out Boolean searches, combining relevant medical subject headings used to index papers in the database, such as “telemedicine,” “telecommunication,” and “Sweden.” It is worth reiterating that telemedicine was introduced as a medical subject heading in PubMed in 1993. The term “telecommunication” predates telemedicine as a medical subject heading, so that to search PubMed for discussion of telemedicine before 1993, one must instead use the subject heading “telecommunication.” (Terms such as telehealthcare, telecare, telemonitoring, and eHealth, on the other hand, have so far not been assigned the status of separate headings.) This search was then followed by similar searches in the Swedish medical database Svemed+ (a Swedish version of PubMed that, accordingly, also incorporated telemedicine as a subject heading in 1993) and the Swedish library database Libris.

While I found academic papers in the two medical databases, the search in Libris provided information on various reviews of Swedish telemedicine issued, for example, by municipal agencies and similar bodies. These searches resulted in a collection of approximately 150 publications. In line with the “snowball” approach, I read all the documents to gain a preliminary overview of the involved actors and acquaint myself with the material; I also sifted through reference lists looking for additional interesting titles of documents that I might have missed in my database searches. The readings also resulted in the identification of other involved agencies and some additional governmental and municipal publications. I then visited the websites of these actors and was able to gather more material. Through this complementary inventory, the number of documents grew to more than 200, ranging from short, one-page pieces to policy documents of 300 pages. The date range of the material ranged from 1956 into the first decade of the twenty-first century.

Reading the documents “with the grain,” attempting to understand what had been going on in telemedicine and adjacent areas, I noted a strong emphasis in the mid 1990s on using telemedicine to address organizational matters concerning issues of availability of care. However, when rereading the material in an “against the grain” manner, I began to notice that approaches to the issue of healthcare availability shifted in subtle ways.

Taking an interest in these differences, I decided that comparing various projects initiated during the period might allow me to detect interesting contrasts, highlighting synchronic, coexisting versions of how availability of care was targeted and negotiated in different ways. I identified four projects for

which there was enough empirical data to support an analysis. Once again, my technique of carefully reading the papers both with and against the grain, as well as in relation to each other, made it possible to note both similarities between projects (all highlighting the importance of healthcare availability and the need to reform it) and important variations (e.g., different definitions of “availability of care”).

I then decided to contrast how different versions of healthcare availability were negotiated between the four projects with how it was discussed in the healthcare political agenda as represented by, for example, municipal agencies and governmental policy, and I was able to specify how not all versions received the same support.

The empirical material for the paper covers the period from 1994 to 2003, but also includes a short excursion into three more recent publications from 2006 and 2010, which I used to briefly cite current developments in telecare and eHealth.

Like the tele-ultrasonography paper, the paper entitled “From Medicine by Wire to Governing Wireless: Changing Geographies of Healthcare” was a response to an invitation to contribute a chapter to an edited volume. The topic of the book was transformations of the Swedish welfare state. The stated goal of the editors was to study shifts toward new forms of governance, including an increased emphasis on citizen self-regulation, and I was encouraged to trace such developments in the Swedish healthcare sector through the lens of telemedicine. At this stage, however, I had decided that it was important not to limit myself to telemedicine. Through my empirical readings, I had seen how many actors were starting to turn their attention away from telemedicine toward telecare, corresponding to the increased importance accorded to the growing and often overlapping groups of the elderly and patients with chronic conditions. Subsequently, I felt that I had to update my empirical material on what was taking place in Sweden to capture more recent trends concerning telecare and any associated emerging forms of governance. By now, I had become quite familiar with the various uses of ICT for the purposes of healthcare at a distance in Sweden, and I knew where to turn to find more recent material on both telecare and the growing area of eHealth—areas that frequently overlapped. I updated my database searches to retrieve more recent material and applied my acquired familiarity with the field to locate additional texts concerning the elderly, patients with chronic conditions, and the use of ICT. This resulted in approximately 70 documents, adding several more layers to the snowball of previously collected material.

Given the task of tracing shifts in governance in this paper, I did not make use of comparison in a synchronic manner. Instead, I tracked changes in an

archeological manner by “following the actors” through different periods. To do so in the most comprehensive way, I chose to include all the empirical material I had gathered on the Swedish situation, so the material I consulted when writing this paper dates all the way back to 1956 and up to 2011. By working archeologically through comparison and contrast and, once again, reading documents both with and against the grain, I was able to demonstrate how various tele-solutions for implementing healthcare at a distance were drawn together linearly by various actors, on one hand, but how, on the other, different forms of usage had emerged in different periods. By using material spanning more than 50 years of development, I was able to identify shifts in application and demonstrate how such changes were intertwined with transformations in Swedish healthcare governance.

Beginning to work on the fourth and final paper, “Redesigning (Tele)Healthcare: Unfolding New Spaces of Visibility,” I decided that I wanted to examine telecare solutions directed toward the elderly and patients with chronic conditions in greater detail, but this time not treating them as overlapping groups as I had done in my previous paper. In reading the STS-inspired social science literature on telecare, I had recognized that telecare was frequently discussed in relation to just one of the groups, and the few papers that included both groups treated them as very much the same. Accordingly, I felt that it could be interesting to contrast them.

Once again, I was confronted with the need for a structured approach in collecting my data. In contrast to the subfield of tele-ultrasonography, but paralleling the general use of the term telemedicine, a great many publications address telecare. Looking for a solution, I decided that a good way of going about this was to limit myself to one of the leading academic journals devoted to the topic: *Telemedicine and e-Health*. It was first established in 1995 as the *Telemedicine Journal* before changing its title to *Telemedicine Journal and e-Health* in 2000 and again in 2005 to simply *Telemedicine and e-Health*. (This change aligns well with the increasing importance attributed to eHealth.) It should, however, be recognized that the selection of this particular journal was also somewhat pragmatic, as this was the only one of the leading relevant journals to which my library subscribed.

To gain an overview, I browsed through every issue of the journal from the first issue of 1995 up to the last issue of 2011. I followed the same procedure as when collecting material for the tele-ultrasonography paper: First, I checked the article titles. I downloaded the paper if the title looked promising according to my stipulated interest in tracing differences between telecare directed toward the elderly and toward chronic-care patients. This resulted in an initial collection of 161 papers. I then leafed through all of them to see if I

could find some way of sorting and categorizing them to reduce the corpus to a more manageable size. I noted that, in the case of tele-solutions for chronic conditions, four conditions stood out: asthma, chronic obstructive pulmonary disease, diabetes, and heart failure. There was also a fifth recurring track, namely, the remote monitoring of pacemakers. Having compared all five, I concluded that, whereas the first four shared many interesting similarities in purpose and design, remote pacemaker monitoring was very different. The first four all focused on involving the patient in using various devices to monitor their conditions in their everyday living environments. The remote monitoring of pacemakers, by contrast, was often promoted by healthcare professionals seeking ways of automatically monitoring the functioning of the surgically implanted device. As I was not interested in comparing different tele-solutions for patients with chronic conditions, but wanted to compare telecare for the elderly with telecare for chronic-care patients, I decided to exclude this application from further analysis as it was so different. By instead focusing on the similarities in solutions targeting the other four conditions, it became possible to analyze these as one group consisting of 33 papers. I decided to assign this group the overall label “telemonitoring,” a term that showed up time and again in the papers.

While my sample of papers addressing telemonitoring derived from my observation of the strong focus on various chronic conditions, the categorization of solutions for the elderly followed a different path. Trying to arrange the material in useful analytical categories, I discovered that some papers used the term “nonintrusive” in describing their applications. In contrast to the emphasis in telemonitoring on involving the patient, these papers focused on designing systems whose operation would not be noticed by the persons being monitored, so as not to disturb them in any way. It was by making a special track out of this category consisting of 18 papers that I detected a recurrent focus on the elderly and the use of so-called nonintrusive solutions in their home environments. I decided to label these nonintrusive concepts for the elderly “smart home” concepts as the term “smart home” kept appearing in the papers.

With the predetermined aim of not treating telecare as homogeneous in kind, either by addressing just one group or by treating telecare for the elderly and for chronic-care patients as overlapping, I then turned to the empirical analysis. Once again, I used my way of reading both with and against the grain. By doing so, I was, for example, able to identify how the elderly targeted with smart home concepts and chronic-care patients targeted with telemonitoring solutions were by default of design assumed to prefer certain roles regarding their degree of responsibility for monitoring their health.

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However, these assigned roles differed considerably between the two groups. In fact, applying the tools of contrast and comparison to my empirical material on smart home concepts and telemonitoring, I was able to illustrate how the two groups were very much positioned as each other's opposite.

9

Summary of the Papers

Paper I: (Re)Producing the Fetal Patient: Tele-ultrasonography and the Constitution of Obstetrical Knowledges.

The first paper explores the rationales for fetal tele-ultrasonography and the ramifications of its usage. Whereas ultrasound is accredited with enabling the visualization of fetal malformations and the identification of “at-risk pregnancies,” combining it with telemedicine lets the fetus be virtually transported as digital code to medical specialists located at centers of excellence. Proponents of tele-ultrasonography expect this to allow for medical knowledge to be dispersed in a more equitable manner, reaching new client populations as well as making it possible for expecting women to avoid costly and stressful travel. Virtualization is further expected to afford new ways for the better use of limited specialist resources, resulting in improved care quality and efficiency.

In paying attention to these democratization and streamlining agendas and to the way they played out between projects, we set out to demonstrate that the introduced telecommunications technology cannot, and should not, be reduced to a mere relay for transmitting medical information. Instead, the paper stresses that the rationales for introducing tele-ultrasonography have ripple effects along the chain of assembled actors. We illustrate how its use reconfigures authority between healthcare professionals, challenging and reconstituting medical knowledge. For example, the paper highlights how the rationale for combining telemedicine with ultrasonography builds partly on questioning the role of sonographers and their professional knowledge. Telemedicine is sometimes advocated on the grounds that it prevents obstetric specialists from being dependent on sonographers performing poor ultrasound scans and frequently misinterpreting the resulting images. By introducing telemedicine to transmit real-time images and further combining it with recent innovations in ultrasonography equipment that, almost irrespectively of how the sonographer handles it, generates a readable and moving 3D im-

age, the “weak link” of the sonographer can now be sidestepped by harnessing IT.

However, apart from reconfiguring the roles and responsibilities of specialists and sonographers, the introduction of tele-ultrasonography is of course bound to affect the relationship between medical expertise, expecting women, and fetuses. Building on the ANT concept “chains of translations” and the interrelated notions of “action at a distance” and “immutable mobiles,” the paper aims to make visible possible shifts in the relations between these actors. In rephrasing “chains of translations” as “chains of extractions,” we want to go beyond focusing on the ambitions of the (medical) center to digitally lift and transport the fetus out of the womb and also take into consideration how this might challenge the mother–fetus bond and the woman’s status as a knowing actor. As social science research into ultrasound has already demonstrated, the digital visualization of the fetal figure has shifted medical attention away from the woman toward the “real-time” event on the ultrasound screen. We contend that by introducing an arrangement that renders the physical presence of the expecting woman unnecessary, as the fetus can now not only be visually displayed but also be virtually extracted from her body for cross-planetary circulation, she might be further pushed out of the picture.

As for the division of work tasks between me and my coauthor, I was responsible for data collection and carried out the initial analysis, identifying recurring topics throughout the material and formulating themes. Given my interest in relations of space and time, I paid particular attention to the folding of distance and center and periphery issues. This was followed by ongoing discussion of the material between the two of us in which my spatiotemporal thinking was complemented by my coauthor’s longstanding interest in the fetal figure and the maternal project. In this process I, for example, suggested that we should work with the concepts “chains of translation” and the “immutable mobile.” My coauthor agreed but importantly coined the phrase “chains of extractions” as a more thought-provoking alternative to the abstract “chains of translations.” These discussions resulted in our first draft, guided by my American coauthor’s eloquent and vivid style of writing, which we then both iteratively commented on and critiqued, sending it back and forth between us. I was then solely responsible for the concluding discussion section and the final revision before submission.

Paper II: From Medicine by Wire to Governing Wireless: Changing Geographies of Healthcare.

The second paper applies a governmentality perspective and the concept of “governing at a distance” (i.e., governmentality scholars’ adaptation of the ANT concept “action at a distance”) to trace transformations of the purpose and usage of telemedicine and telecare in Sweden. Its key argument is that “governing at a distance” should not be reduced to a matter of actor ambitions to govern others *in* space and time as if space and time formed a neutral backdrop. Instead, one should consider how acts of governing at a distance involve the shaping of the spatial and temporal.

The first part of the paper focuses on how the clinical usage of telecommunications during the 1990s was transformed from something medical professionals had experimented with as a means of giving medical advice and assisting colleagues at a distance, into an important organizational tool introducing new ways of governing Swedish healthcare. In implementing telemedicine infrastructure on a large scale, health economists, policymakers, and medical professionals believed that it would be possible to create a more streamlined healthcare. Inspired by influential management theories such as “lean production,” proponents of telemedicine argued that practicing medicine by wire would allow for healthcare resources to be gathered around patients already at their first point of entry, such as the primary care center, which could contact specialists for advice by telemedicine. Building on the popular notion of patient-centeredness it was, for example, argued that information should move between levels of care, not patients.

Examining these developments through the lens of “governing at a distance,” I draw attention to the assumptions underlying these efforts. What at the first glance might appear to be a seamless flow of medical information actually involves attempts to govern by spatial and temporal routines. If telemedicine was assumed to allow more timely care closer to patients, it was also supposed to keep as many patients as possible out of hospital space, out of costly sickbeds, and from unnecessarily taking up specialists’ time. From once being used by medical professionals to reach out across distances, telemedicine as a tool of governing was now also being used in Sweden in an effort to keep patients at a distance.

The second part of this paper details how telemedicine used for intra-organizational purposes would come to be accompanied by telecare services to be operated by patients in their home environments. As elsewhere, telecare in Sweden has been introduced mainly to manage the growing and increasingly challenging populations of the elderly with deteriorating health and patients with chronic conditions, two groups that often overlap. In many

ways, telemedical desires to improve care quality and efficiency by relocating patients to lower levels of care by electronic means would continue in telecare. However, whereas telemedicine became a tool for managerialist intentions to influence medical professionals' referral patterns, telecare has been intimately associated with efforts to reshape the relationship between healthcare professionals and citizens/patients in line with fashionable ideas of increasing patient involvement. The paper illustrates how positioning the patient as a resource and co-actor in medical work has become intertwined with a reshaping of patient-centeredness, meaning that healthcare is no longer centered around the (passive) patient but should be developed jointly with the (active) patient. In the case of telecare, this has been especially manifest in telecare services that make patients responsible for self-monitoring medical signs and symptoms, often on a daily basis, their data being digitally transferred to responsible clinics.

Once again, the paper attempts to reveal how something that could be framed as a technical fix for improving access to healthcare resources, now bringing healthcare all the way into the home and on a daily basis, also involves acts of governing by spatial and temporal arrangements, this time in an effort to increase patients' capacity to govern themselves. I contend that subtracting space, i.e., bringing healthcare closer to patients, translates into bringing patients into a closer relationship with their condition by involving them in self-monitoring. Here achieving more timely provision of care involves making self-monitoring patients continuously and speedily aware of how their condition is evolving, so they can take precautions to prevent matters from turning to the worse by changing their behavior.

Paper III: Medicine at a Distance in Sweden: Spatiotemporal Matters in Accomplishing Working Telemedicine.

This paper discusses what defines successful technology through the case of the usage of Swedish telemedicine at the turn of the century. More specifically, it investigates differences in aims to productively use telemedicine to reform healthcare services, focusing on issues of availability of care. Two ways in which ANT analysts understand the success of innovations are contrasted in the paper. The first is associated with the concept of "action at a distance" and a center's (e.g., as represented by a "heroic inventor") ability to determine the fate of some form of technology. The second perspective emphasizes the benefit of allowing the fate of technology to be in the hands of others.

I explain how the concept of "action at a distance" has been described as too Machiavellian, focusing on the creation of a center exerting dominance

over actors at the periphery. Shifting to the study of successful innovations, the paper argues, in line with the criticism leveled against some STS scholars, that their emphasis on the compliance of others with the interests of the center has made many ANT studies too focused on measuring technological success from the perspective of central actors. Working and successful technology has therefore been defined as what arises when the center manages to build a network allowing it to set in place “black-boxed” and hegemonic technology used as determined by the center. The paper then contrasts this approach with more recent ANT work that suggests that the success of an innovation might very well depend on enabling other actors to adapt it for their own purposes. This denotes what, in geographical terms, has been described as the difference between fluid space, where technology thrives by allowing its relations to change, and network space, where the success of technology is defined by its ability to keep its relations stable as it travels and is used.

In line with the argument that adaptability makes innovations successful, by examining four Swedish telemedicine projects initiated around the country, I illustrate how they all shared an interest in using telemedicine to reform access to care, but for very different reasons, and how they, accordingly, adapted telemedicine to their particular situations. For example, I highlight how their intentions to address healthcare availability by electronically folding distance in an effort to improve cooperation between specialists and lower levels of care became intertwined with how patients’ distance from adequate healthcare resources was constituted and measured: was treatment just a few or hundreds of kilometers away, and was treatment months away or almost immediately available? The paper further demonstrates that, depending on how project participants and evaluators chose to define these variables and rank their importance, their goals and project setups also differed. For example, were hardware and software to be designed to allow general practitioners to immediately contact specialists if patient pain was understood to be unbearable? Or was it enough just to schedule sessions every other week if cases were not deemed to need acute intervention, however stressful this might be for patients? Was management in densely populated areas defining telemedicine as intended to keep as many patients as possible away from scarce specialist resources? Or were doctors in scarcely populated regions with long travel distances using telemedicine to make it possible for patients to access specialists more easily?

From highlighting how telemedicine seems to strive to be many different things, attracting interest from around the country, the paper then contrasts this fluidity with the aims of public and municipal bodies to use telemedicine

in an aligned and structured way to rationalize the Swedish healthcare system. I illustrate how the fluidity of telemedicine turned out to be a problem to these actors, who were unable to coordinate developments and criticized projects for being too localized and too clinically focused. Furthermore, they were not equally supportive of all versions of telemedicine, downplaying its use in rural areas as a special case not to be confused with telemedicine as a tool for reorganizing the overall healthcare system. Unable to use telemedicine in the way they wanted, they began to lose interest in it and even questioned its very existence. Instead, they channeled support in other directions, for example, toward telecare. Telemedicine had become too fluid for these actors. Hence, the paper contends that for technology to succeed and travel well, it should contain the ability to inhabit both fixed and fluid relations.

Paper IV: Redesigning (Tele)Healthcare: Unfolding New Spaces of Visibility.

The fourth paper argues that, contrary to prevailing discourses of how healthcare delivery will become independent of space and time as telehealthcare is introduced, telecare for personalized health monitoring actually works by *unfolding new spaces of visibility*, establishing new temporalities as well.

The paper highlights how healthcare professionals use telecare to extend medical decision-making into targeted individuals' living spaces where things are usually not arranged according to the standardized spaces of healthcare institutions but are more likely to follow the more fluid course of lived life. By means of telecare, healthcare professionals are gaining ongoing electronic access, monitoring individuals' everyday lives and environments in ways that go far beyond intermittent visits to the clinic or occasional scheduled home visits. Given the blurred boundary between medical/care space and social/private space, healthcare staff are expected to respond quickly to threatening changes in individual health and behavior, obviating the need for more complex and acute interventions that often result in resource-demanding and costly hospitalization.

The paper aims to demonstrate, by combining ANT with insights from human geography, that the new visibilities afforded to healthcare professionals by telecare do not provide a window onto something that is already there. Instead, I argue that these visibilities are inextricably shaped by the ways technomedical practices and knowledge production processes are intertwined with politico-economic aims to establish certain versions of "liberated" individuals in an effort to ensure functioning healthcare systems. In making this argument, I contrast the design of two versions of telecare: smart home solu-

tions for the elderly and telemonitoring for patients with chronic conditions, both of which are supposed to keep individuals from needing costly care at healthcare institutions.

In the case of smart homes, I delineate how encouraging elderly people to exercise their freedom to live at home as long as possible, commonly framed as “independent living,” has been translated into the design of “nonintrusive” systems that, through embedded sensors, automatically collect data about the health and whereabouts of the people concerned. By designing systems that monitor the lives of elderly people with minimal interference, it is arguably possible to maintain their sense of independence. However, the paper illustrates how this rationale has been taken further and has, for example, come to denote the dismissal of the elderly as reliable communicators of how they feel, downplaying their capacity to faithfully and adequately report symptoms. Instead, advocates of smart homes argue that automatically retrieved measurements of vital signs and behavior patterns provide both a more responsive and a more trustworthy basis for medical decision-making, allowing the detection of somebody’s deteriorating health even at a presymptomatic stage. The elderly are assigned a passive role: they are not supposed to interfere in the operation of the system, which is left to healthcare professionals.

I then illustrate how this is all very different in the case of telemonitoring, for chronic care patients. In the rhetoric surrounding these patients, a liberated individual equals an “empowered” patient, meaning that patients should be enabled to take control over their conditions by increasingly engaging in self-care activities. To accomplish this, these telemonitoring systems are designed to enable patients to self-monitor signs and symptoms associated with their conditions, and to relate these to their daily behavior, such as how much they exercise, smoke, and drink. These systems thus cast patients as in need of education. The aim of system design is therefore both to shift medical work from healthcare professionals to patients and to try and make it immediately obvious to patients how signs and symptoms correlate with their behavior, improving their abilities to following the assigned treatment plan. Patients are thus designated an active and responsible role and are positioned as users.

The paper contends that these emerging spaces of visibility produce a certain form of legibility, rendering the actions, bodies, and environments of those monitored intelligible in specific ways. Technomedical projects are interrelated with politico-economic goals: in their design, telemonitoring and smart homes entwine the production, status, and format of medical information with the formation of certain versions of the liberated individual and the roles to be played by citizens and professionals. This is something to

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which the discourses celebrating the neutralization of geography through ICT risk becoming blind to in their belief that ICT will serve to erase spatial complexity.

10

Conclusion

A major theme running throughout this introduction is that eHealth, including telehealthcare, is routinely assumed to make it possible to achieve a de-spatialized healthcare. This thesis, on the contrary, represents an attempt to re-spatialize telehealthcare. I have demonstrated that innovations in telehealthcare are not neutral and do not neutralize geography. They do not simply effect a shift to more sophisticated machines and modalities, distance being made invisible as care is optimized by the turn to ICT. In this thesis, the assumption that these services will create a new ubiquitous and homogenous healthcare space, free from delimiting boundaries and allowing for automatic monitoring of citizens wherever they are, is being challenged.

Building on ANT and adding to the existing body of STS work on telehealthcare, I have argued that telemedicine and telecare innovations need to be understood in a relational manner, recognizing that the technical and the social are always folded into each other through acts of negotiation and translation, the outcome constituting heterogeneous assemblages. I have thereby demonstrated that telehealthcare inevitably entails intertwining healthcare practices with socioeconomic concerns to form technological configurations that are highly political. This conception of technology has been integrated with a similar perception of geography. Accordingly, in mapping the emerging landscape of telehealthcare, I have refused to limit myself to pursuing a Euclidean geography whose orthogonal coordinates constitute a fixed background to the establishment of computer networks stretching across land and connecting sites in a grid-like manner. Instead, I have pursued a relational geography, the fundamental assumption of which is that electronic, physical, and social spaces are perpetually intertwined into spatiotemporal formations. Combining these two relational approaches to geography and technology into geography of heterogeneous relations, I have highlighted how the introduction of telehealthcare services almost inevitably involves, not the abandonment and dissolution of boundaries, but their rearrangement, the outcome

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often being something very different from the intentions of those driving these developments.

I have traced the efforts of various actors, such as governments, county councils, and municipalities, to extend the potential of telehealthcare, making it into a tool for governing at a distance so as to improve organizational streamlining by transgressing various institutional, geographical, and professional boundaries. Analyzing the politics of these developments led me to conclude that they involve an attempt to establish a new geography of healthcare management by virtualization. In this new geography, it is preferably the spaces and times of the lowest possible care levels that should be occupied or, sometimes even more desirably, the spaces and times of citizens' everyday lives.

But as this thesis has demonstrated, assessments as to what level of care is the most appropriate for a specific case are situated acts involving a multitude of priorities that do not obviously match the rationales of managerial efficiency. Rather, such decision-making often follows a logic guided by healthcare professionals' concerns over the patients they encounter. For example, telemedicine projects aiming to reconfigure the distance and access to care may be configured very differently depending on what goals are being pursued. Considering competing rationales offers insights into the problems of establishing telehealthcare as a tool for national governance, as attempts to achieve a homogenized healthcare space are challenged by the fluidity resulting from the shifting aims of heterogeneous project networks. In theoretical terms, this provides an example of a multitude of networks that collectively create a situation of fluidity resisting subsumption under ambitions to achieve alignment and formalization, in this case, for acts of governance. In addition, the outcomes of initiated projects may even be the opposite of initial intentions. In fact, the desire to keep as many patients as possible away from specialists might well result in *more* cases being reviewed at higher levels of care. For example, when specialists are supposed to be reachable by general practitioners, almost at the speed of a mouse-click, it can be very tempting to call on a specialist in situations of the slightest uncertainty. Hence, new modes of accessibility and healthcare delivery cannot be accomplished through quick technical fixes. Telehealthcare can afford new spatiotemporal possibilities, but the formation of these geographies is not a matter of simple, predictable implementation. These projects can take many shapes, and so too do their resulting geographies.

Fluidity, I have argued, also characterizes ongoing attempts to extend telehealthcare beyond intra-organizational issues toward digitally connecting medical and care institutions with citizens' ongoing lives through telecare.

CONCLUSION

However, while fluidity may be considered an obstacle to governmental and managerial ambitions to achieve streamlining, in this case fluidity may constitute an asset. The possibility of monitoring the flux of everyday life, for example, in situations in which elderly people and patients with chronic conditions are beyond the control of wards and clinics of medicine and care, is of interest to many advocates of telecare. By means of various instruments for data retrieval introduced in individuals' living environments, and through algorithmic computer processing, new spaces for medical decision-making unfold on the screens of the staff in charge. Accordingly, this provides yet another instance of formalized arrangements encountering situations of flux. These monitoring facilities represent attempts to feed on the fluid space of lived life, incorporating it into the standardized and regulated spaces of medicine and care so as to improve individuals' health outcomes, and ultimately healthcare budgets.

As I have demonstrated, telemedicine and telecare resist attempts at homogenization: they exist in a multitude of versions and shapes, sometimes aligned with others but not uncommonly causing friction. However, by tracing historical transformations as well as describing the coexistence of multiple services and initiatives, I have positioned myself at a vantage point allowing me to gain an overview of the continually emerging telehealthcare landscape. I have thus been able to identify some general patterns in the development of telehealthcare. The initial aim of folding space and time, I contend, reaching out to various groups beyond the range of medical expertise, has increasingly been accompanied by a managerial and policy interest in saving space and time. In the case of the management of elderly people and patients with chronic conditions, this has meant that new spatiotemporal formations are being unfolded through reaching into their bodies and ongoing lives.

Finally, a normative conclusion can be drawn from attending closely to these geographical formations. My advice to policymakers, developers, managers, and other interested parties is to resist the illusion that a uniform spacetime can be created. Critically rethinking the geographies of healthcare at a distance, going beyond imaginaries of the virtual as transparent relays for obtaining a healthcare of "anywhere" and "everywhere," and recognizing, instead, the continued proliferation of a multiplicity of spatial and temporal entanglements, would allow them to make wiser decisions. Far from being redundant once services are up and running, spatial and temporal relations remain central when eHealth and telehealthcare are set in place. To paraphrase Latour (2004), instead of taking the defeat of geography by ICT as a matter of fact and as an inherent capacity of such innovations, the way soci-

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otechnical and spatiotemporal relations are forged ought to become a matter of concern, given that they are permeated by political implications and ambitions. By unfolding and critically analyzing some of the manifestations and materializations of the geographies of healthcare at a distance, this thesis, I hope, will help open the merits of these initiatives up for discussion.

References

- Akrich, M. (1992) The De-Description of Technical Objects. In W. E. Bijker and J. Law (Eds.), *Shaping Technology – Building Society: Studies in Sociotechnical Change*, pp. 205-244. Cambridge, MA. and London: MIT Press.
- Akrich, M. (1993) Essay of Techno-Sociology: A Gasogene in Costa Rica. In P. Lemonnier (Ed.), *Technological Choices – Transformations in Material Culture Since the Neolithic*, pp. 289-337. London and New York: Routledge and Kegan Paul.
- Allen, J. (2011) Topological Twists: Power's Shifting Geographies. *Dialogues in Human Geography* 1(3): 283-298.
- Atkinson, P., Coffey, A., Delamont, S., Lofland, J., and Lofland, L. (2001) Editorial Introduction. In P. Atkinson, A. Coffey, S. Delamont, J. Lofland, and L. Lofland (Eds.), *Sage Handbook of Ethnography*, pp. 1-8. Thousand Oaks, CA.: Sage.
- Barnes, B. (1977) *Interests and the Growth of Knowledge*. London and Boston: Routledge and Kegan Paul.
- Barry, A. (2001) *Political Machines: Governing a Technological Society*. London: The Athlone Press.
- Beaulieu, A. (2010) From Co-Location to Co-Presence: Shifts in the Use of Ethnography for the Study of Knowledge. *Social Studies of Science* 40(3): 453-470.
- Berg, M. (1999) Patient Care Information Systems and Health Care Work: A Sociotechnical Approach. *International Journal of Medical Informatics* 55(2): 87-101.
- Berg, M. (2001) Implementing Information Systems in Health Care Organizations: Myths and Challenges. *International Journal of Medical Informatics* 64(2-3): 143-156.
- Berg, M. and Goorman, E. (1999) The Contextual Nature of Medical Information. *International Journal of Medical Informatics* 56(1-3): 51-60.
- Berg, M. and Akrich, M. (2004) Introduction – Bodies on Trial: Performances and Politic in Medicine and Biology. *Body & Society* 10(2-3): 1-12.
- Bijker, W. E. (1995) *Of Bicycles, Bakelites, and Bulbs: Toward a Theory of*

- Sociotechnical Change*. Cambridge, MA.: MIT Press.
- Bingham, N. (1996) Object-ions: From Technological Determinism Towards Geographies of Relations. *Environment and Planning D: Society and Space* 14(6): 635-657.
- Bingham, N. and Thrift, N. Some New Instructions for Travellers: The Geography of Bruno Latour and Michel Serres. In M. Crang and N. Thrift (Eds.), *Thinking Space*, pp. 281-301. London and New York: Barnes & Noble.
- Bloomfield, B. P (1991) The Role of Information Systems in the UK National Health Service: Action at a Distance and the Fetish of Calculation. *Social Studies of Science* 21(4): 701-734.
- Bloor, D. (1976) *Knowledge and Social Imagery*. London: Routledge.
- Boczkowski, P. and Lievrouw, L. A. (2008) Bridging STS and Communication Studies: Research in Media and Information Technologies. in E. J. Hackett, O. Amsterdamska, M. Lynch, and J. Wajcman (Eds.) *New Handbook of Science and Technologies Studies*, pp. 951-977. Cambridge, MA.: MIT Press.
- Brown, N. and Webster, A. (2004) *New Medical Technologies and Society: Reordering Life*. Cambridge, U.K. and Malden, MA.; Polity Press.
- Callon, M. (1980) Struggles and Negotiations to Define what is Problematic and what is Not: The Socio-logic of Translation. In K. D. Knorr and A. Cicourel (Eds.), *The Social Process of Scientific Investigation. Sociology of Sciences Yearbook vol. 4*, pp. 197-221. Boston: D. Reidel Publishing Company.
- Callon, M. (1986) Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Briec Bay. In J. Law (Ed.), *Power, Action and Belief: A New Sociology of Knowledge?, Sociological Review Monograph 32*, pp. 196-223. London: Routledge and Kegan Paul.
- Callon, M. (1987) Society in the Making: The Study of Technology as a Tool for Sociological Analysis. In W. E. Bijker, T. P. Hughes, and T. J. Pinch (Eds.), *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, pp. 83-106. Cambridge, MA and London, U.K.: MIT Press.
- Callon, M. (1991) Techno-Economic Networks and Irreversibility. In J. Law (Ed.), *A Sociology of Monsters: Essays on Power, Technology and Domination, Sociological Review Monograph 38*, pp. 132-161. London: Routledge.
- Callon, M. (2002) Writing and (Re)writing Devices as Tools for Managing

REFERENCES

- Complexities. In J. Law and A. Mol (Eds.), *Complexities: Social Studies of Knowledge Practices*, pp. 191-217. Durham, N. CA.: Duke University Press.
- Carincross, F. (1997) *The Death of Distance*. London: Orion Business Books.
- Cartwright, L. (2000) Reach Out and Heal Someone: Telemedicine and the Globalization of Health. *Health* 4(3): 347-377.
- Casper, M. and Morrison, D. (2010) Medical Sociology and Technology: Critical Engagements. *Journal of Health and Social Behavior* 51(1): s120-32.
- Collins, H. M. (1975) The Seven Sexes: A Study in the Sociology of a Phenomenon, or the Replication of Experiments in Physics. *Sociology* 9(2): 205-234.
- Collins, H. M. (1981) Stages in the Empirical Programme of Relativism. *Social Studies of Science* 11(1): 3-10.
- Collins, H. M. (1981) The Place of the “Core-Set” in Modern Science: Social Contingency with Methodological Propriety in Science. *History of Science* 19: 6-19.
- Collins H. M. (1992) *Changing Order*. Chicago and London: University of Chicago Press (2:nd edn.).
- Coopmans, C. (2006) Making Mammograms Mobile: Suggestions for a Sociology of Data Mobility. *Information, Communication & Society* 9(1): 1-19.
- Cooper, R. (1992) Formal Organization as Representation: Remote Control, Displacement and Abbreviation. In M. Reed and M. Hughes (Eds.), *Rethinking Organization. New Directions in Organization Theory and Analysis*, pp. 254-272. London: Sage.
- Cooper, R. and Law, J. (1995) Organization: Distal and Proximal Views. In S.B. Bacharach, P. Gagliardi, and B. Mundell (Eds.), *Research in the Sociology of Organizations: Studies of Organizations in the European Tradition*, pp. 275-301. Greenwich, Conn: JAI Press.
- Curtis, S. (2004) *Health and Inequality: Geographical Perspectives*. London: Sage.
- Cutchin, M. P. (2002) Virtual Medical Geographies: Conceptualizing Telemedicine and Regionalization. *Progress in Human Geography* 26(1): 19-39.
- Czarniawska-Joerges, B. and Sevón G. (1996) *Translating Organizational Change*. Berlin and New York: Walter de Gruyter.
- Darkins, A. W. and Carey, M. A. (2000) *Telemedicine and Telehealth: Principles, Policies Performance and Pitfalls*. New York: Springer Publishing Company.

GEOGRAPHIES OF eHEALTH

- de Laet, M. and Mol, A. (2000) The Zimbabwe Bush Pump: Mechanics of a Fluid Technology. *Social Studies of Science* 30(2): 225-263.
- Dyb, K. and Halford, S. (2009) Placing Globalizing Technologies. Telemedicine and the Making of Difference. *Sociology* 43(2): 232-249.
- EC (2004) E-Health – Making Healthcare better for European Citizens: An Action Plan for a European E-Health Area. Brussels, 2004-04-30, COM 356.
- EC (2006) ICT for Health and i2010 – Transforming the European Healthcare Landscape – Towards a Strategy of ICT for Health. European Commission for Society and Media, Luxembourg: ISBN 92-894-7060-7.
- EC (2007a) Together for Health: A Strategic Approach for the EU 2008-2013. White Paper. Brussels, 2007-10-23, COM 630.
- EC (2007b) Ageing Well in the Information Society. An i2020 Initiative. Action Plan on Information and Communication Technologies and Ageing. Brussels, 2007-06-14, COM 332.
- EC (2008) On Telemedicine for the Benefit of Patients, Healthcare Systems and Society. Brussels, 2008-11-04, COM 689.
- EC (2010a) A Healthy Approach – Technology for Personalised, Preventative Healthcare. ICT Research: The Policy Perspective. Luxembourg: ISBN 978-92-79-16085-1.
- EC (2010b) A Digital Agenda for Europe. Brussels, 2020-06-26, COM 245.
- EC (2010c) Europe 2020 Flagship Initiative. Innovation Union. Brussels, 2010-06-10, COM 546.
- EC (2012a) eHealth Task Force Report: Redesigning Health in Europe for 2020. European Union, Luxembourg: ISBN 978-92-79-2354 2-9.
- EC (2012b) eHealth Action Plan 2012-2020 – Innovative Healthcare for the 21st Century. Brussels, 2012-06-12, COM 736.
- Ferguson, M. (1990) Electronic Media and the Redefining of Time and Space. In M. Ferguson (Ed), *Public Communication: The New Imperatives. Future Direction for Media Research*, pp. 152-172. London: Routledge.
- Finn, N. B. and Bria, W. F. (2009) *Digital Communication in Medical Practice*. London: Springer-Verlag.
- Fox-Keller, E. and Longino, H. E. (Eds.) (1996) *Feminism and Science*. New York: Oxford University Press.
- Gherardi, S. (2010) Telemedicine: A Practice-Based Approach to Technology. *Human Relations* 63(4): 501-524.
- Graham, S. (1998) The End of Geography or the Explosion of Place? *Progress in Human Geography* 22(2): 165-185.
- Guattari, F. (1995) *Chaosmosis: An Ethico-Aesthetic Paradigm*. Sydney:

- Power Publications.
- Halford, S., Lotherington, A. T., Obstfelder, A., and Dyb, K. (2010) Getting the Whole Picture? New Information and Communication Technologies in Healthcare Work and Organization. *Information, Communication & Society* 13(3): 442-465.
- Haraway, D. (1991) *Simians, Cyborgs and Women: The Reinvention of Nature*. New York: Routledge.
- Harvey, D. (1989) *The Condition of Postmodernity*. Oxford: Blackwell.
- Henke, C. and Gieryn, T. (2007) Sites of Scientific Practice: The Enduring Importance of Place. In E. J. Hackett, O. Amsterdamska, M. Lynch, and J. Wajcman (Eds.), *The Handbook of Science and Technology Studies*, pp. 355-376. Cambridge, MA: MIT Press.
- Hess, J. D. (2001) Ethnography and the Development of Science and Technology Studies. In P. Atkinson, A. Coffey, S. Delamont, J. Lofland, and L. Lofland (Eds.), *Sage Handbook of Ethnography*, pp. 234-245. Thousand Oaks, CA.: Sage.
- Hine, C. (2007) Multi-sited Ethnography as a Middle Range Methodology for Contemporary STS. *Science, Technology & Human Values* 32(6): 652-671.
- Hooder, I. (2000) The Interpretation of Documents and Material Culture. In N.K. Denzin and Y.S. Lincoln (Eds), *Handbook of Qualitative Research*, pp 703-716. London: Sage.
- Jones, M., Jones, R., and Woods, M. (2004) *An Introduction to Political Geography: Space, Place and Politics*. London and New York: Routledge.
- Kavanagh, D. and Araujo, L. (1995) Chronigami: Folding and Unfolding Time. *Accounting, Management and Information Technologies* 5(2): 103-121.
- Kirsch, S. (1995) The Incredible Shrinking World? Technology and the Production of Space. *Environment and Planning D: Society and Space* 13(5): 529-555.
- Klecun-Dabrowska, E. and Cornford, T. (2002) Organising vision of tele-health. *Proceedings of the 10th European Conference on Information Systems*, pp. 1206-1217. Gdansk, Poland.
- Knorr-Cetina, K. (1981) *The Manufacture of Knowledge – An Essay on the Constructivist and Contextual Nature of Science*. Oxford: Pergamon Press.
- Knorr-Cetina, K. (1995) Laboratory Studies: The Cultural Approach to the Study of Science. In S. Jasanoff, G. E. Markle, J. C. Peterson and T. Pinch (Eds.), *Handbook of Science and Technology Studies*, pp. 140-166. Thousand Oaks, CA., London, New Delhi: Sage.

- Knorr-Cetina, K. (1999) *Epistemic Cultures: How the Sciences Make Knowledge*. Cambridge, MA: Harvard University Press.
- Koch, A. (2004) "Nowhere and No Here" The Hybrid Nature of Communities and Spaces. *Networks and Communication Studies* 18(3-4): 171-179.
- Langstrup, H. (2008) Making Connections through Online Asthma Monitoring. *Chronic Illness* 4(2): 118-126.
- Latour, B. (1986) The Powers of Associations. In J. Law (Ed), *Power, Action and Belief: A New Sociology of Knowledge?*, *Sociological Review Monograph* 32, pp. 264-280. London: Routledge & Kegan Paul.
- Latour, B. (1987) *Science in Action: How to Follow Scientists and Engineers Through Society*. Cambridge, MA.: Harvard University Press.
- Latour, B. (1988) A Relativistic Account of Einstein's Relativity. *Social Studies of Science* 18(1): 3-44.
- Latour, B. (1990) Drawing Things Together. In M. Lynch and S. Woolgar (Eds.), *Representation in Scientific Practices*, pp. 19-68. Cambridge, MA.: MIT Press.
- Latour, B. (1991) Technology is Society Made Durable. In J. Law (Eds.), *A Sociology of Monsters: Essays on Power, Technology and Domination*, *Sociological Review Monograph* 38, pp. 103-132. London: Routledge.
- Latour, B. (1993a) *We Have Never Been Modern*. Cambridge, MA.: Harvard University Press.
- Latour, B. (1993b) Ethnography of High-Tech: About the Aramis Case. In P. Lemonnier (Ed.), *Technological Choices – Transformations in Material Culture Since the Neolithic*, pp. 372-398. London and New York: Routledge and Kegan Paul.
- Latour, B. (1996) *Aramis, or the Love of Technology*. Cambridge, MA.: Harvard University Press.
- Latour, B. (1997) Trains of Thought: Piaget, Formalism and the Fifth Dimension. *Common Knowledge* 3(6): 170-191.
- Latour, B. (1999) *Pandora's Hope: Essays on the Reality of Science Studies*. Cambridge, MA.: Harvard University Press.
- Latour, B. (2002) Gabriel Tarde and the End of the Social. in P. Joyce (Ed.), *The Social in Question. New Bearings in History and the Social Sciences*, pp. 117-132. London and New York: Routledge.
- Latour, B. (2004) Why has Critique Run out of Steam? From Matters of Fact to Matters of Concern. *Critical Inquiry* 30(2): 225-248.
- Latour, B. (2005) *Reassembling the Social: An Introduction to Actor-network-Theory*. Oxford: Oxford University Press.
- Latour, B. and Woolgar, S. (1979) *Laboratory Studies: The Social Construction of Scientific Facts*. Beverly Hills, CA., London: Sage.

REFERENCES

- Latour, B. and Woolgar, S. (1986) *Laboratory Studies: The Construction of Scientific Facts*. Beverly Hills, CA., London: Sage (2:nd edn.).
- Law, J. (1986) On Methods of Long Distance Control: Vessels, Navigation, and the Portuguese Route to India. In J. Law (Ed.), *Power, Action and Belief: A New Sociology of Knowledge? Sociological Review Monograph 32*, pp. 234-263. London: Routledge & Kegan Paul.
- Law, J. (1991) Introduction: Monsters, Machines and Sociotechnical Relations. In J. Law (Ed.), *A Sociology of Monsters: Essays on Power, Technology and Domination, Sociological Review Monograph 38*, pp. 1-25. London: Routledge.
- Law, J. (1992) Notes on the Theory of the Actor-Network: Ordering, Strategy, and Heterogeneity. *Systems Practice 5*(4): 379-393.
- Law, J. (2002) Objects and Spaces. *Theory, Culture & Society 19*(5-6): 91-105.
- Law, J. (2008) On Sociology and STS. *The Sociological Review 56*(4): 623-649.
- Law, J. (2009) Actor Network Theory and Material Semiotics. In B. S. Turner (Ed.), *The New Blackwell Companion to Social Theory*, pp. 141-158. Oxford: Blackwell Publishing.
- Law, J. and Mol, A. (2001) Situating Technoscience: An Inquiry into Spatialities. *Environment and Planning D: Society and Space 19*(5): 609-621.
- Law, J. and Singleton, V. (2005) Object Lessons. *Organization 13*(3): 331-355.
- Lehoux, P. (2004) The Use of Technology at Home: What Patient Manuals Say and Sell Vs. What Patients Face and fear. *Sociology of Health & Illness 26*(5): 617-644.
- Lehoux, P. (2008) The Duality of Health Technology in Chronic Illness: How Designers Envision Our future. *Chronic Illness 4*(2): 85-97.
- Lemke, T. (2007) An Indigestible Meal? Foucault, Governmentality and State Theory. *Distinktion: Scandinavian Journal of Social Theory 8*(2): 43-64.
- Linderth, H. C. J. (2002) Implementation and Evaluation of Telemedicine – a catch 22? *Proceedings of 35th Hawaii International Conference on Systems Sciences*, Hawaii, USA.
- López, D. (2010) The Securitization of Care Spaces: Lessons from Telecare. In M. Schillmeier and M. Domènech (Eds.), *New Technologies and Emerging Spaces of Care*, pp. 40-55. Farnham: Ashgate.
- López, D. and Domènech, M. (2008a) On Inscriptions and Ex-Inscriptions: the Production of Immediacy in a Home Telecare Service. *Environment and Planning D: Society and Space: 26*(4) 663-675.

- López, D. and Domènech, M. (2008b) Embodying Autonomy in a Home Telecare Service. *The Sociological Review* 56(s2): 181-195.
- López, D. and Sánchez-Criado, T. (2009) *Dwelling the Telecare Home: Place, Location and Habitability*. *Space and Culture* 12(3): 343-358.
- Lynch, M. (1985) *Art and Artifact in Laboratory Science: A Study of Shop Work and Shop Talk in a Research Laboratory*. London: Routledge and Kegan Paul.
- Mackenzie, D. A. and Wajcman J. (Eds.) (1985) *The Social Shaping of Technology: How the Refrigerator got its Hum*. Milton Keynes, U.K.: Open University Press.
- Malone, R. E. (2003) Distal Nursing. *Social Science & Medicine* 56(11): 2317-2326.
- Massey, D. (2005) *For Space*. London: Sage.
- Mathar, T. (2010) Body-Identity Trajectories of Preventive.Selves++. In T. Mathar and Y. J. F. M. Jansen (Eds.), *Health Promotion and Prevention Programmes in Practice. How Patients' Health Practices are Rationalised, Reconceptualised and Reorganised*, pp. 171-193. Bielefeld: Transcript Verlag.
- May, C. (2006) Mobilising Modern Facts: Health Technology Assessment and the Politics of Evidence. *Sociology of Health & Illness* 28(5): 513-532.
- May, C. and Ellis, N. T. (2001) When Protocols fail: Technical Evaluation, Biomedical Knowledge, and the Social Production of "Facts" about a Telemedicine Clinic. *Social Science & Medicine* 53(8): 989-1002.
- May, C., Finch, T., Mair, F., and Mort, M. (2005) Towards a Wireless Patient: Chronic Illness, Scarce Care and Technological Innovation in the United Kingdom. *Social Science & Medicine* 61(7): 1485-1494.
- May, C., Gask, L., Atkinson, T., Ellis, N., Mair, F., and Esmail, A (2001) Resisting and Promoting New Technologies in Clinical Practice: The Case of Telepsychiatry. *Social Science & Medicine* 52(12): 1889-1901.
- May, C., Mort, M., Williams, T., Mair, F., and Gask, L. (2003a) Health Technology Assessment in its Local Contexts: Studies of Telehealthcare. *Social Science & Medicine* 57(4): 697-710.
- May, C., Rapley, T., Moreira, T., Finch, T., and Heaven, B. (2006) Techno-governance: Evidence, Subjectivity, and the Clinical Encounter in Primary Care Medicine. *Social Science & Medicine* 62(4): 1022-1030.
- Medawar, P. (1964) Is the Scientific Paper Fraudulent? Yes; it Misrepresents Scientific Thought. *Saturday Review* Aug 1.: 42-3.
- Milligan, C. (2009) *There's no Place like Home: Place and Care in an Ageing Society*. Farnham: Ashgate.

REFERENCES

- Milligan, C., Roberts, C., and Mort, M. (2011) Telecare and Older People: Who Cares Where? *Social Science & Medicine* 72(3): 347-354.
- Mitchell, W. (1995) *City of Bits: Space, Place and the Infobahn*. Cambridge, MA.: MIT Press.
- Mol, A. (2002) *The Body Multiple: Ontology in Medical Practice*. Durham, N. CA. and London: Duke University Press.
- Mol, A. and Law, J (1994) Regions, Networks and Fluids: Anaemia and Social Topology. *Social Studies of Science* 24(4): 641-671.
- Mol, A. and Mesman, J. (1996) Neonatal Food and the Politics of Theory: Some Questions of Method. *Social Studies of Science* 26(2): 419-444.
- Mort, M., Finch, T., and May, C. (2009) Making and Unmaking Telepatients: Identity and Governance in New Health Technologies. *Science, Technology & Human Values* 34(1): 9-33.
- Mort, M., May, C., Finch, T., and Mair F. S. (2004) Telemedicine and Clinical Governance: Controlling Technology, Containing Knowledge. In A. Gray and S. Harrison (Eds.), *Governing Medicine: Theory and Practice*, pp. 107-121. Buckingham: Open University Press.
- Mort, M., May, C., and Williams, T. (2003) Remote Doctors and Absent Patients: Acting at a Distance in Telemedicine? *Science, Technology & Human Values* 28(2): 274-295.
- Mort, M. and Smith A. (2009) Beyond Information: Intimate Relations in Sociotechnical Practice. *Sociology* 43(2): 215-231.
- Moser, I. and Law, J. (2006) Fluids or Flows? Information and Qualculation in Medical Practice. *Information Technology & People* 19(1): 55-73.
- Murdoch, J. (1997) Towards a Geography of Heterogeneous Associations. *Progress in Human Geography* 21(3): 321-337.
- Murdoch, J. (1998) The Spaces of Actor-Network Theory. *Geoforum* 29(4): 357-74.
- Murdoch, J. (2006) *Post-Structural Geography: A Guide to Relational Space*. London: Sage.
- Nicolini, D. (2006) The Work to Make Telemedicine Work: A Social and Articulative View. *Social Science & Medicine* 62(11): 2754-2767.
- Nimmo, R. (2011) Actor-Network Theory and Methodology: Social Research in a More-Than-Human World. *Methodological Innovations Online* 6(3): 108-119.
- Olesen, F. and Markussen, R. (2006) Working with Material Things: From Essentialism to Material-Semiotic Analysis of Sociotechnical Practice. In O. Dreier and A. Costall (Eds.), *Doing Things with Things: The Design and Use of Everyday Objects*, pp. 167-192. Aldershot: Ashgate.
- Oppenheim, R. (2007) Actor-Network Theory and Anthropology after Scie-

- nce, Technology, and Society. *Anthropology Theory* 7(4): 471-493.
- Oudshoorn, N. (2008) Diagnosis at a Distance: The Invisible Work of Patients and Healthcare Professionals in Cardiac Telemonitoring Technology. *Sociology of Health & Illness* 30(2): 272-288.
- Oudshoorn, N. (2009) Physical and Digital Proximity: Emerging Ways of Health Care in Face-to-Face and Telemonitoring of Heart-Failure Patients. *Sociology of Health & Illness* 31(3): 390-405.
- Oudshoorn, N. (2011) *Telecare Technologies and the Transformation of Healthcare*. Houndmills: Palgrave Macmillan.
- Oudshoorn, N. (2012) How Places Matter: Telecare Technologies and the Changing Spatial Dimensions of Healthcare. *Social Studies of Science* 42(1): 121-142.
- Panofsky, A. L. (2010) A Critical Reconsideration of the Ethos and Autonomy of Science. In C. Calhoun (Ed.), *Robert K. Merton: Sociology of Science and Sociology as Science*, pp. 140-163. New York: Columbia University Press.
- Percival, J. and Hanson, J. (2006) Big Brother or Brave New World? Telecare and its Implications for Older People's Independence and Social Inclusion. *Critical Social Policy* 26(4): 888-909.
- Pinch, T. (1981) The Sun-Set: The Presentation of Certainty in Scientific Life. *Social Studies of Science* 11(1): 131-158.
- Pinch, T. J. and Bijker W. E. (1984) The Social Construction of Facts and Artefacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other. *Social Studies of Science* 14(3): 399-441.
- Pols, J. (2010) Telecare: What Patients Care About. In A. Mol, I. Moser, and J. Pols (Eds.), *Care in Practice*, pp. 171-194. Bielefeld: Transcript Verlag.
- Pols, J. (2012) *Care at a Distance: On the Closeness of Technology*. Amsterdam: Amsterdam University Press.
- Pols, J. and Moser, I. (2009) Cold Technologies versus Warm Care? On Affective and Social Relations with and Through Care Technologies. *Alter – European Journal of Disability Research* 3(2): 159-178.
- Prior, L. (2008) Repositioning Documents in Social Research. *Sociology* 42(5): 821-836.
- Quattrone, P. and Hopper, T. (2005) A "Time-Space Odyssey": Management Control Systems in Two Multinational Organisations. *Accounting, Organizations and Society* 30(7-8): 735-764.
- Roberts, C. and Mort, M. (2009) Reshaping what Counts as Care: Older

- People, Work and New Technologies. *ALTER – European Journal of Disability Research* 3(2): 138-158.
- Roberts, C., Mort, M., and Milligan, C. (2012) Calling for Care: “Disembodied” Work, Teleoperators and Older People Living at Home. *Sociology* 46(3): 490-506.
- Robins, K. (1997) The New Communications Geography and the Politics of Optimism. *Soundings* 5: 191-202.
- Rose, D. (1994) The Evolution of Intervention. *Anthropology and Humanism* 19(1): 88-103.
- Rose, N. and Miller, P. (1990) Governing Economic Life. *Economy and Society* 19(1): 1-31.
- Rose, N. and Miller, P. (1992) Political Power Beyond the State: Problematics of Government. *British Journal of Sociology* 43(2): 172-205.
- Sassen, S. (2001) The Impact of the New Technologies and Globalization on Cities. In A. Graafland and D. Hauptman (Eds.), *Cities in Transition*, pp. 212-220. Rotterdam: 010 Publishers.
- Schillmeier, M. and Domènech, M. (Eds.) (2010) *New Technologies and Emerging Spaces of Care*. Farnham: Ashgate.
- Sinha, A. (2000) An Overview of Telemedicine: The Virtual Gaze of Health Care in the Next Century. *Medical Anthropology Quarterly* 14(3): 291-309.
- Star, S. L. (1991) Power, Technologies and the Phenomenology of Conventions: On being Allergic to Onions. In J. Law (Ed.), *A Sociology of Monsters? Essays on Power, Technology and Domination, Sociological Review Monograph* 38, pp. 26-56. London: Routledge.
- Star, S. L. and Strauss, A. (1999) Layers of Silence, Arenas of Voice: the Ecology of visible and Invisible Work. *Computer Supported Work* 8(1-2): 9-30.
- Strathern, M. (1996) Cutting the Network. *Journal of the Royal Anthropological Institute* 2(3): 517-535.
- Strauss, A. (1985) Work and the Division of Labor. *The Sociological Quarterly* 26(1): 1-19. Thrift, N. (1996) *Spatial Formations*. London: Sage.
- Timmermans, S. and Berg, M. (2003) The Practice of Medical Technology. *Sociology of Health & Illness* 25(3): 97-114.
- Vikkelsø, S. (2010) Mobilizing Information Infrastructure, Shaping Patient-centered Care. *International Journal of Public Sector Management* 25(4): 340-352.
- Wajcman, J. (2004) *Technofeminism*. Cambridge, U.K.: Polity Press.
- Warf, B. (2011) Teaching Time-Space Compression. *Journal of Geography in Higher Education* 35(2): 143-161.

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- Webster, A. (2007) *Health, Technology and Society: A Sociological Critique*. Basingstoke: Palgrave Macmillan.
- Whatmore, S. (1997) Dissecting the Autonomous Self: Hybrid Cartographies for a Relational Ethics. *Environment and Planning D: Society and Space* 15(1): 37-53.
- Whitten, P. and Collins, B. (1997) The Diffusion of Telemedicine: Communicating an Innovation. *Science Communication*, 19(1): 21-40.
- Whitten, P. and Davenport Sypher, B. (2006) Evolution of Telemedicine from an Applied Communication Perspective in the United States. *Telemedicine and e-Health* 12(5): 590-600.
- WHO (2005) Fifty-Eight World Health Assembly Resolution on eHealth (WHA58.28). Geneva, 2005-05-25.
- WHO (2006) Building Foundations for eHealth: Progress of Member States: Report of the Global Observatory for eHealth. Geneva: WHO Press.
- WHO (2010) Telemedicine: Opportunities and Developments in Member States: Report on the Second Global Survey on eHealth 2009. (Global Observatory for eHealth Series, 2). Geneva: WHO Press.
- WHO (2011a) Atlas eHealth Country Profiles: Based on the Findings of the Second Global Survey on eHealth. (Global Observatory for eHealth Series, 1). Geneva: WHO Press.
- WHO (2011b) mHealth : New Horizons for Health through Mobile Technologies: Second Global Survey on eHealth. (Global Observatory for eHealth Series –Volume 3). Geneva: WHO Press.
- WHO (2012) Legal Frameworks for eHealth: Based on the Findings of the Second Global Survey on eHealth. (Global Observatory for eHealth Series, v. 5). Geneva: WHO Press.
- Woolgar, S. (1991) Configuring the User: The Case of Usability Trials. In J. Law (Ed.), *A Sociology of Monsters: Essays on Power, Technology and Domination, Sociological Review Monograph 38*, pp. 58-100. London: Routledge.
- Woolgar, S., Coopmans, C., and Neyland, D. (2009) Does STS mean Business? *Organization* 16(1): 5-30.

Svensk sammanfattning

Summary in Swedish

I den här avhandlingen undersöks praktiserandet av vård på distans med hjälp av informations- och kommunikationsteknik (IKT) med syfte att överkomma spatiala och temporala hinder i hälso- och sjukvården. Dessa lösningar benämns ofta telemedicin och televård och placeras många gånger under den sammanhållande paraplytermen eHälsa. Med telemedicin avses i regel vård på distans inom de traditionella vårdsinrättningarna, t.ex. möjligheten att digitalt kunna skicka röntgenbilder för bedömning av expertis vid ett specialistsjukhus, eller att hålla en videokonferens med kollegor för att diskutera kring medicinska frågor och ibland med en berörd patient som deltagare. Med televård åsyftas vanligtvis lösningar som kopplar ihop hälso- och sjukvårdens institutioner med människors vardagsmiljöer, såsom deras hem. Här används olika applikationer för att försöka fånga upp förändringar i individers hälsolägen. Det kan röra sig om digitala blodtrycksmätare, vågar och blodsockermätare, sensorer som kan registrera om någon har ramlat i sin bostad, eller system som automatiskt fångar upp personers rörelsemönster i hemmet. Informationen kan sedan på elektronisk väg skickas vidare till hälso- och sjukvårdspersonal för bedömning. Televård har blivit särskilt intressant för att försöka hantera den ökande andelen äldre människor och patienter diagnostiserade med kroniska tillstånd. Dessa två grupper anses ställa framtidens hälso- och sjukvård inför väldiga utmaningar. Både från professionellt och politiskt håll är man rädd att det varken ska finnas tillräckligt med personal eller pengar för att klara av att hantera dem på ett tillfredsställande sätt.

Många aktörer förväntar sig i det här sammanhanget att nya tekniska framsteg inom eHälsa-området ska öppna upp betydande möjligheter för att åstadkomma en mer strömlinjeformad vård som ska kunna bidra till att öka både effektiviteten och kvaliteten inom hälso- och sjukvården. I t.ex. Världshälsoorganisationens och Europeiska Unionens publikationer kring eHälsa genomsyras inte sällan dessa tankegångar av en teknikoptimistisk retorik som beskriver framväxten av ett modernt IKT-baserat hälso- och sjukvårdslandskap. I detta nya (e)hälsolandskap ska implementeringen av digitala lösningar

leda till en hälso- och sjukvård utan varken geografiska, institutionella eller professionella hinder där medicinsk vård och omvårdnad via olika applikationer ska kunna utföras var som helst och när som helst, t.ex. över mobiltelefonen.

I avhandlingen kriseras den här typen av teknikoptimistisk retorik – där digitaliseringens möjligheter förväntas resultera i en hälso- och sjukvård fri från rumsliga och tidsmässiga begränsningar – för att i praktiken skymma många av de spatiotemporala komplexiteter involverade i att introducera vård på distans, så väl som i organiserandet av hälso- och sjukvården i stort. Jag argumenterar för att det går att koppla dessa tankemodeller till en form av teknikdeterminism som gör det felaktiga antagandet att IKT har en inneboende kapacitet att frigöra oss från spatiotemporala hinder. Ett sådant perspektiv resulterar lätt i både en instrumentell förståelse av telemedicin och televård som en fråga om att implementera redan fungerande teknik och i villfarelsen att digitalisering skapar en cyberrymd definierad av en omedelbarhet som nästan per automatik gör det möjligt att lämna många av hälso- och sjukvårdens rumsliga och tidsmässiga villkor bakom sig.

För att inte fastna i dessa tankemodeller insisteras det i avhandlingen att det tekniska såväl som det geografiska måste förstås relationellt som alltid sammanflätade med det sociala. I fördjupandet av det här resonemanget integrerar jag perspektiv utvecklade inom teknik och vetenskapsstudier, främst aktör-nätverksteori (ANT), med insikter från kulturgeografi. Genom att kombinera dessa två akademiska fält argumenterar jag för att telemedicin och televård ska förstås som heterogena nätverk där det sociotekniska och det spatiotemporala är inkorporerade i varandra, ofta i dynamiskt skiftande skepnader. Telemedicin- och televårdsapplikationer får alltså sina former och attribut av hur t.ex. medicinska logiker och vårdpraktiker via introducerandet av diverse IKT-lösningar på olika sätt kontinuerligt flätas ihop med samhälleliga problematiseringar och upplevda ekonomiska rationaliteter. Dessa sociotekniska nätverk vävs samtidigt samman med en spatiotemporalitet där virtuella, fysiska och sociala geografier sammansmälter och skapas tillsammans genom sina relationer till varandra och till de sociotekniska nätverken. Genom att anlägga ett sådant perspektiv på det tekniska och geografiska hävdar jag att det blir möjligt att på ett kritiskt sätt analysera dels de spatiotemporala visioner som präglar telemedicin och televård och dels konsekvenserna av att introducera den här typen av innovationer i hälso- och sjukvårdsorganisationen, så väl som i människors vardagsliv. I de fyra artiklarna som ingår i avhandlingen har sedan olika aspekter av dessa utgångspunkter utvecklats via kvalitativt grundade fallstudier som tillsammans undersöker såväl historiska

förändringar som samexistensen av olika varianter av telemedicin och televård och deras resulterande, inte sällan motsägelsefulla, geografier.

Artikel 1

I artikel 1 undersöker jag och min medförfattare olika teleultrasonografiprojekt för att kontrollera eventuella foster- och graviditetskomplikationer. Vi argumenterar för att teleultrasonografi varken kan eller får reduceras till användandet av telekommunikation som ett transparent relä för överföring av medicinsk information. Istället betonar vi hur införandet av teleultrasonografi påverkar relationerna mellan de inblandade aktörerna och deras professionella roller. T.ex. så belyses det hur argumentationen för att kombinera telemedicin med fosterultraljudsskanning bl.a. ha kommit att bygga på ett ifrågasättande av sonografiteknikernas roll och där teleultrasonografi förs fram som ett sätt att komma runt vad som ibland beskrivs som en bristande medicinsk kunskap hos teknikerna. Med hjälp av telemedicinlänken kan nu nämligen specialisterna övervaka teknikernas arbete i realtid och därmed direkt uppmärksamma och påtala eventuella brister i hur de utför ultraljudsundersökningen.

Men utöver att ha inverkan på specialistläkarnas och sonografiteknikernas roller och ansvarsfördelningen emellan dem så undersöker vi också hur introduktionen av teleultrasonografi kan påverka relationen mellan den medicinska expertisen, de havande kvinnorna och foster. Med hjälp av bl.a. ANT-konceptet "chains of translation", som beskriver arbetet med att skapa en kedja av relationer mellan människor och ting som genom en översättningsprocess koordinerar och fixerar dem mot ett gemensamt mål, undersöker artikeln möjliga förändringar i relationen mellan dessa aktörer. Via en omformulering av "chains of translation" till "chains of extraction" vill vi uppmärksamma vilken påverkan möjligheten för specialisterna att digitalt extrahera fostret ur kvinnas livmoder kan ha på relationen mellan den havande kvinnan och fostret och kvinnas status som en kunskapsaktör. Som tidigare forskning redan har visat så har användandet av ultraljud för att digitalt visualisera fostret förflyttat uppmärksamheten från kvinnan mot realtidshändelserna på ultraljudsskärmen. Vi hävdar att i och med introduktionen av ett arrangemang som gör kvinnans fysiska närvaro överflödigt när nu fostret inte bara kan visas upp visuellt utan också på virtuell väg kan lyftas ut ur hennes kropp för spridning till medicinska expertcenter runt om i världen så riskerar hon att ytterligare försvinna ut ur bilden.

Artikel 2

Den andra artikeln undersöker historiska förändringar i svenska aktörers ambitioner att försöka använda telemedicin och televård som styrinstrument för att skapa en mer strömlinjeformad hälso- och sjukvård. Här använder jag mig av begreppet ”governance at a distance” och som är en version av ANT-begreppet ”action at a distance” (som beskriver villkor för att kunna kontrollera händelser på avstånd) men anpassat till studiet av styrprocesser inom den s.k. governmentality-traditionen. Artikelns huvudargument är att ”governance at a distance” inte ska reduceras till aktörers ambitioner att styra över andra *genom* tid och rum utan att ”governance at a distance” involverar själva formandet av spatiala och temporala relationer.

Genom att anlägga det här perspektivet så visar jag hur svensk telemedicin i ökande utsträckning har förvandlats från att handla om att nå ut till de som inte enkelt har kunnat få medicinsk hjälp på något annat sätt till att bli ett verktyg för att hållas patienter *utanför kostsam sjukhusvård* och hindra dem från att uppta specialisers redan *knappa tid*. Här har telemedicin ansetts ge möjligheter för en bättre matchning mellan vilka patienter som kan behållas på en lägre vårdnivå och vilka som bör få remiss till högre vårdnivåer genom att t.ex. primärvården bereds möjligheten att via datorskärmen kunna ta kontakt med sjukhusspecialister vid behov av en expertbedömning. Detta har också sagts knyta an till en s.k. patientcentrerad vård i det avseendet att resurserna direkt samlas runt patienten i linje med organisationsteorier som ”lean management”.

Televård har också kommit att förstås som ett styrverktyg men på ett delvis annorlunda sätt. Som jag nämnde i det inledande stycket så binder televård ihop hälso- och sjukvårdsinstitutionerna med äldre och kroniskt sjukas hemmiljöer. En ofta omnämnd applikation av televård är telemonitorering och som vanligtvis innebär att patienter blir delansvariga för att med hjälp av olika digitala apparater övervaka och registrera medicinska tecken och upplevda symtom, ofta på en daglig basis. Genom att de involverar patienten har telemonitoreringsapplikationer blivit intimt förknippade med populära idéer kring att öka patientens makt. Till detta har också kopplats en version av patientcentrering-begreppet där vården inte längre samlas runt (den passiva) patienten utan ska utvecklas tillsammans med (den aktiva) patienten. På så sätt förväntas patienten också bli en resurs i vårdarbetet vilket ska leda till både kvalitets- och effektivitetsvinster. Detta kan dock genom en spatiotemporal lins förstås som ett sätt att försöka öka patienters självkännet/kontroll genom att de fås att inträda i en mer *nära och intim* relation till sitt tillstånd där patienterna *snabbt och kontinuerligt* blir uppdaterad på hur deras tillstånd utvecklas via telemonitoreringsapplikationen. I och med det förväntas de

också kunna förändra sitt beteende om deras hälsa skulle utvecklas till det sämre så att en potentiellt farlig situation kan förhindras och kostsam sjukhusvård kan undvikas.

Artikel 3

Artikel 3 diskuterar vad som definierar framgångrik teknologi. Diskussionen kontrasterar två olika ANT-perspektiv kring hur bäst man förstå en innovations framgång. Det första perspektivet utgår från hur ett centrum, t.ex. en "heroisk" uppfinnare, förmår kontrollera en innovations öde. Det andra perspektivet betonar fördelen med att tillåta att en innovations öde är i andras händer, t.ex. de som använder den. De två perspektiven beskrivs ibland i spatiala termer som skillnaden mellan å ena sidan en fluid spatialitet där en teknologis relationer tillåts, och till och med tjänar på, att variera, och å andra sidan en mer fixerad spatialitet där en teknologis framgång definieras genom dess kapacitet att hålla sina relationer stabila medan den sprids och används på olika ställen. D.v.s. en fluid spatialitet känneteckna av föränderliga relationer medan en fixerad spatialitet domineras av oföränderliga relationer.

Diskussionen sker genom en jämförelse av fyra svenska telemedicinprojekt som trots att de alla fokuserade på att reformera patienters tillgänglighet till vård med hjälp av telemedicin gick till väga på olika sätt och där de anpassade telemedicin i relation till projektens skilda utgångspunkter och förhållanden. Jag visar hur deras ambitioner att angripa problem kring vårdtillgång genom att försöka förbättra samarbetet mellan specialister och lägre vårdnivåer på elektroniskt väg sammanflätades med hur patienters avstånd till vård kom att specificeras och mätas: handlade det bara om ett fåtal kilometer eller hundratals, var väntetiden månader bort, eller kunde vård ges nästan omedelbart? Hur projektdeltagare och utvärderare valde att definierar dessa variabler och ranka deras betydelse påverkade på olika sätt projektens syfte, upplägg och utfall. Skulle t.ex. hård- och mjukvaran tillåta att allmänläkare omedelbart kunde nå specialister i de fall då patientens smärta var stor? Var det kanske tillräckligt att schemalägga mötessektioner varannan vecka om det inte var nödvändigt med akutåtgärder, men där patienter dock kände visst obehag? Definierades telemedicin som ett sätt att i tätbefolkade områden hålla så många patienter som möjligt borta från ansträngda specialistresurser? Eller användes telemedicin i glesbygdsområden med långa reseavstånd till att göra det möjligt för patienter att enklare få tillgång till specialistresurser? Via den här jämförelsen mellan projekt så visar jag hur telemedicin existerar i många olika versioner och hur möjligheten att kunna tillämpa

telemedicin på ett anpassat sätt gjorde telemedicin attraktivt för aktörer med överlappande men delvis olika intressen.

Den här fluiditeten medförde dock problem för aktörer med ambitioner att använda telemedicin som ett styrinstrument i en gemensam nationell och regional ansträngning för att skapa en mer strömlinjeformad hälso- och sjukvård. De fick svårigheter att koordinera utvecklingen och kritiserade projekt för att vara för lokala och för medicinskt fokuserade, och de stödde inte heller alla versioner med samma entusiasm. Ibland ansåg de t.ex. att telemedicin för glesbygdsyften var en specialtillämpning som inte fick förväxlas med vikten av telemedicin som ett verktyg för att omorganisera hälso- och sjukvården i sin helhet. För dessa aktörer blev det svårt att fixera telemedicins alla versioner i en enhetligt och homogen riktning som kunde uppfylla deras ambitioner. Telemedicin var helt enkelt för flytande för dem och de började överge telemedicin för andra alternativ, t.ex. televård.

Artikeln drar slutsatsen att en teknologisk framgång och spridning underlättas om den kan rymma både fixerade och fluida relationer.

Artikel 4

I den avslutande artikeln argumenterar jag för att vad som än sägs om möjligheterna att koppla loss hälso- och sjukvården från dess rumsliga och tidsmässiga betingelser via vård på distans så kan televård förstås som ett sätt att producera nya spatiotemporaliteter. Via televård vill nämligen hälso- och sjukvården skapa sig en (digital) bild av individers tillvaro och pågående liv, d.v.s. deras rumsliga och tidsmässiga betingelser. Argumentet utvecklas via en jämförelse mellan s.k. smarta hem för äldre och telemonitorering för patienter med kroniska tillstånd varmed det görs synligt hur de resulterande spatiotemporaliteterna formas i relation till olika konceptualiseringar av dessa två grupperns önskningar, förmågor och ansvar.

Smarta hem bygger många gånger på sensorsystem för automatisk övervakning av äldre vilket ofta motiveras med att de möjliggör för äldre att tryggt kunna bo kvar längre hemma, något som sägs innebära ett mer självständigt liv jämfört med att vistas vid institution, så som ett äldreboende. Dock så har motiven kring automatiserad övervakning också kommit att inbegripa ett ifrågasättande av äldres möjlighet att bedöma sin hälsa och där automatiserade mätningar förs fram som ett mer säkert sätt att utvärdera deras tillstånd och som till och med gör det möjligt att detektera förändringar redan på ett presymtomatiskt stadium. Men genom att systemen är automatiserade tilldelas också de äldre en passiv roll där det är hälso- och sjukvårdspersonalen som tillsammans med systemen förväntas hålla uppsikt över de äldres hälsa.

Telemonitorering å andra sidan associeras som tidigare nämnts ofta med s.k. patientmakt där patienter anses kunna bli mer självständiga visavi hälso- och sjukvården om de förses med verktyg som tillåter egenvård. I telemonitorering sker detta alltså genom att patienter använder olika applikationer för mätning av diverse medicinska variabler ofta också kopplat till symptomuppskattning. På så sätt förväntas patienten ges insikter till hur på bästa sätt hantera sitt tillstånd och förstå t.ex. effekterna av sluta röka och börja motionera. Det handlar i praktiken således i mångt och mycket om att utbilda patienter i linje med en medicinsk förståelse av vad som är bäst för deras hälsa. Här tilldelas alltså patienter (inom vissa ramar) en aktiv och ansvarstagande roll och de positioneras som användare.

Artikeln argumenterar för att den information som visualiseras om patienter och äldre på hälso- och sjukvårdspersonalens skärmar inte ska förstås som ett fönster in till något som redan finns, som att titta genom ett förstöringsglas. Istället argumenterar jag för att det som *görs* synligt är en konsekvens av hur teknomedicinska praktiker och kunskapsprocesser sammanflätas med politikoekonomiska ambitioner kring att försöka skapa vissa specifika versioner av emanciperade individer för att möjliggöra fortsatt hållbara hälso- och sjukvårdssystem. Den här spatiala komplexiteten är något som lätt tappas bort i de diskurser som lovordar informations- och kommunikationsteknikens kapacitet att neutralisera det spatiala varmed dessa komplexiteter också riskerar att falla utanför en diskussion kring vilken framtida hälso- och sjukvård vi som medborgare vill ha med hjälp av lösningar för vård på distans.

Slutsatser

Den här avhandlingen har belyst hur eHälsa, inklusive innovationer inom telemedicin och televård, rutinmässigt tros kunna göra det möjligt att befria hälso- och sjukvården från dess rumsliga och tidsmässiga villkor. Avhandlingen kritiserar sådana antagande och visar istället på hur introduktionen av dessa innovationer bidrar till att såväl synliggöra som att skapa en mängd spatiotemporala komplexiteter. Genom att kombinera en relationell förståelse av det tekniska och det geografiska som alltid sammanflätat med det sociala har det blivit möjligt att problematisera den teknikoptimism som omgärdar introduktionen av dessa innovationer. Därigenom har jag också kunnat peka på hur visioner om att skapa en hälso- och sjukvård befriad från hindrande gränser med hjälp av IKT många gånger i praktiken faktiskt handlar om att etablera nya gränser. Jag har bl.a. påvisat hur aktörer som vill använda telemedicin och televård som styrinstrument för att åstadkomma en mer strömlinjeformad hälso- och sjukvård arbetar för att hålla medborgare utanför

resurskrävande sjukhusvård, vilket i ökad uträkning har kommit att betyda att de helst ska vårdas i hemmet via olika sorters digitala applikationer.

Dessa rationaliseringsambitioner har dock visat sig stöta på problem då önskan att effektivisera långtifrån alltid går väl ihop med de kriterier som hälso- och sjukvårdspersonalen använder i sina bedömningar om vilken omsorg och vård som är den mest ändamålsenliga för individen. Möjligheten till gradförskjutningar av tyngnpunkten i olika projekt mellan t.ex. å ena sidan fokus på förbättrad effektivitet och å andra sidan på förbättrad kvalitet har öppnat upp för en rad olika versioner av vård på distans.

Jag har bl.a. kunnat visa hur konsekvensen av att introducerar telemedicin för att hålla patienter ifrån knappa specialistresurser till och med kan leda till att fler patientfall blir granskade av specialist. För om en primärvårdsläkare erbjuder alternativet att snabbt kunna ta direktkontakt med en specialist via datorn kan det vara frestande för den förre att kontakta den senare vid minsta medicinska tveksamhet. Vård på distans öppnar förvisso upp för nya spatio-temporala möjligheter men de resulterande geografierna är svåra att förutse och går inte att förstå instrumentellt som en konsekvens av teknikens inneboenden egenskaper utan får sin form av hur och i vilken grad hälso- och sjukvårdspraktiker sammanflätas med politiko-ekonomiska rationaliteter.

Men om de många olika versionerna av t.ex. telemedicin har visat sig skapat ett flytande fält som vissa aktörer har uppfattat som problematiskt för att åstadkomma intra-organisatorisk styrning så har en annan variant av fluiditet kommit att ses som en tillgång. I sin strävan att genom televård styra patienter med kroniska tillstånd och äldre människor mot att föredra vård i sin vardagsmiljö försöker nämligen olika aktörer att utvidga den standardiserade hälso- och sjukvårdspraktiken till att också inkludera dessa två grupper flytande och varierande vardagsliv för att på så sätt kunna utöva påverkan. Televårdsapplikationer anses av många ge helt nya möjligheten till att övervaka hur dessa individers hälsa dagligen varierar beroende på hur de väljer att leva sina liv och att sedan använda informationen för att försöka få dem att anpassa sig till en hälsosam livsstil för att förbättra såväl deras välbefinnande som hälso- och sjukvårdens ekonomi.

I geografiska termer kan utvecklingen från telemedicin mot televård beskrivas som att en initial strävan att överbrygga rum och tid för att *nå ut* till olika grupper som har varit bortom den medicinska expertisens räckvidd i ökande omfattningen har kommit att följas av ambitioner att använda telemedicin och televård som styrinstrument för att minska antalet vårdplatser och korta vårdtider. I fallet televård för äldre och patienter med kroniska tillstånd innefattar det utvecklandet av vårdformer och applikationer för produktionen

av spatiotemporala representationer i syfte att kunna *nå in* i deras kroppar och pågående liv.

Genom att konsekvent ha fokuserat på de geografiska dimensionerna av vård på distans vill jag med den här avhandlingen bidra till att få politiska beslutsfattare, ledningar, utvecklare och så vidare att förhålla sig kritiska till teknikoptimistiska visioner om en IKT-baserad hälso- och sjukvård befriad från spatiotemporala begränsningar. Istället bör de rikta sin uppmärksamhet mot alla de nya spatiala och temporala relationer som introduktionen av vård på distans ger upphov till och de konsekvenser de för med sig. Det skulle kunna tydliggöra dessa innovationers politiska implikationer och öppna upp för att diskutera deras värde och användning. Min förhoppning är att den här avhandlingen kan bidra till ett sådant samtal.

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