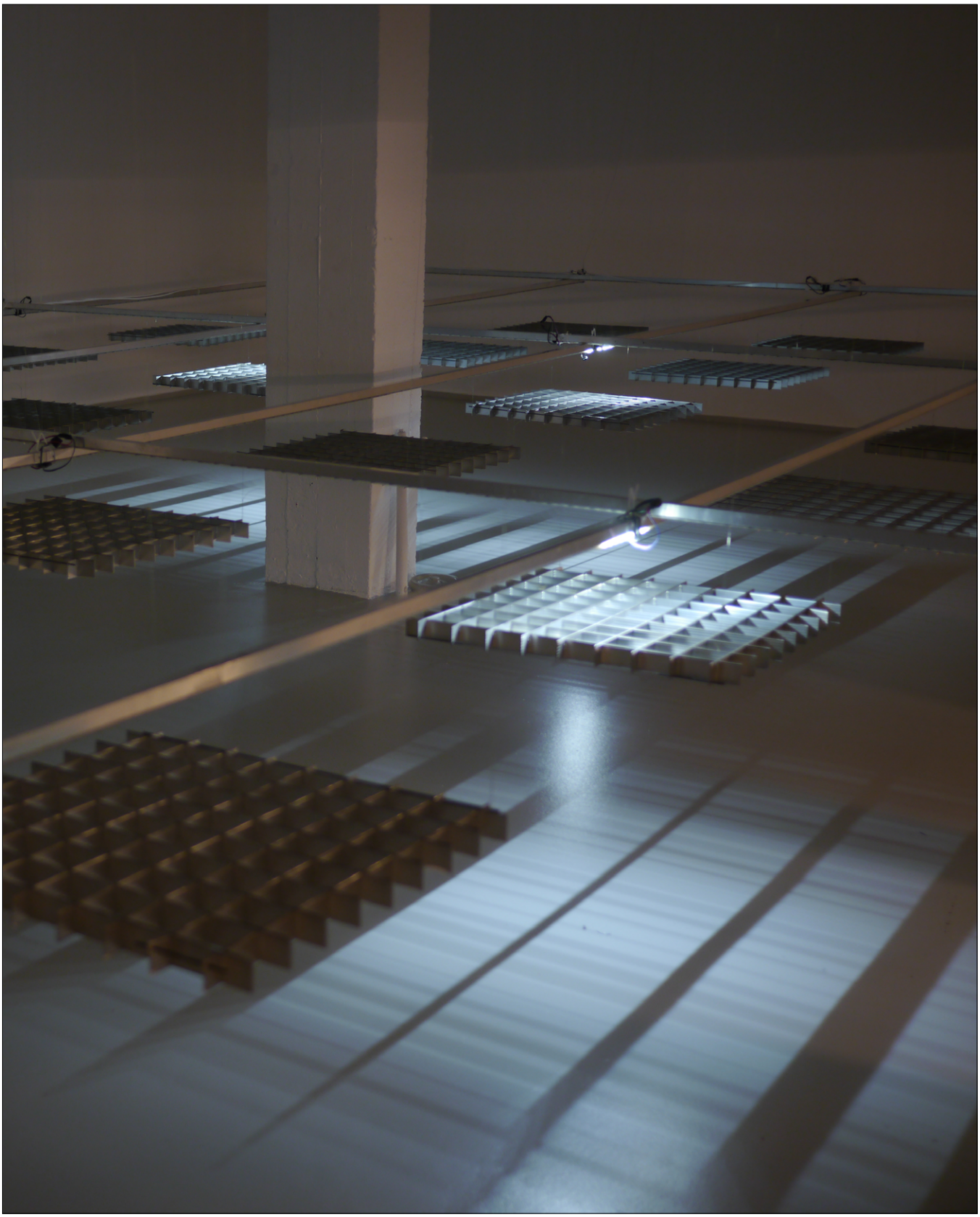
Nordic Journal
of Science
and Technology
Studies

2016 | Volume 4 | Issue 2



"off-the-grid" (2015) by HC Gilje | Photo: HC Gilje

NORDIC JOURNAL
of Science and Technology Studies

Volume 4, issue 2

Editorial

Articles

Book review

About the Artist

Contact:
Department for Interdisciplinary Studies of Culture
Norwegian University of Science and Technology
7491 NTNU, Trondheim, Norway
post@nordicsts.org

Published with the support of the Nordic Research Councils for the Humanities and the Social Sciences and the Norwegian University of Science and Technology.

ISSN: 1894-4647

nordicsts.org

NORDIC JOURNAL
of Science and Technology Studies

EDITORIAL

Make the weird (worlds) great again!

by Tomas Moe Skjølsvold

2016 has been a wild year for democracy. We have seen Donald Trump win the US presidential elections, while Brexit dominated the headlines half a year ago. Across Europe, including the Nordics, right- and left wing populist parties continue to gain foothold. Analysts now struggle to make sense of the situation and they will likely be occupied with both work and soul searching over the coming months and years.

The situation gives room for reflection also from an STS perspective. In our field, there is a strong tradition of giving voice to marginalized publics in the face of technocratic governance. There is also a strong tradition of encouraging public engagement with and participation in knowledge production and innovation, but also in governance more broadly.

Thus, it might instinctively be tempting to side with movements that so openly oppose what is interpreted as top-down, elitist control. One of the more interesting Brexit-slogans was "no more experts!" which could intuitively resonate well with scholars who sided with Brian Wynne's Cumbrian sheep farmers against overly confident scientific expertise in the 1990s. There is, however, no flood of STS-scholars standing up for the anti-scientific rhetoric of the Trump movement or the Brexit incident. Thankfully.

There are many good reasons for this. One of them is the totalizing character of the two movements many slogans. As an example, the idea of "making America great again" is a stellar exercise in reductionism, because it hides the thousands of particular sites where "America" is constantly produced, and the millions of modes of production that goes into making a monstrous hybrid such as the USA. The slogan conceals productive ideas about how to improve life in particular places and for particular actors, through the no-content notion of making "it" "great". It encompasses millions of particulars in a few "wholes", an approach that resonates poorly with the dedication of many STS-scholars to understand the complex peculiarities of the co-production of science, technology and society.

With this as a backdrop it is particularly troubling to observe that the social sciences at large seem to have failed in their analysis of the situation leading up to these incidents. It was unthinkable that Britain would leave the EU. It was considered a joke that mr. Trump could become the next president of the USA. Yet here we are, reflexively and collectively scratching our heads. How could we have missed the dynamics at play?

It would be worth exploring if any of the economic, institutional or cultural aspects of the current knowledge production regimes are partly responsible for producing such blind spots. Is there something in the ways we produce and think about knowledge, that pushes us away from research questions and projects which could better illuminate the situation? It would, for example, be interesting to explore the role different kinds of internationalization. As academics we are increasingly pushed in the direction of pursuing cross-country collaborations, often targeting issues deemed important by supra-national actors. The European Union and its many framework programs for research and innovation comes to mind. While these programs provide valuable funding and strong networks for research groups across Europe, they also format research activities and interests in ways that might not be fortunate for our collective understanding of the diversity of the continent.

Researcher mobility is another avenue worth exploring. Increasingly, scholars roam universities across continents for years, staying a year here, and a year there. While this boosts academic CV's and networks, and is imperative to what is currently labelled "excellence", it might have unintended side effects. It feeds into unfortunate gendered career patterns in academia. We might also ask critically if mobility as a response to top-down pressure concerning how an academic career should look helps in producing contemporary social analysis grounded in cultural understanding. If the global is small and local, as claimed by John Law, then we need to move from internationalization to "inter-localization" in order to ground ourselves and the kinds of knowledge we produce in the small, interconnected localities.

Another activity that is meaningful to many academics is publishing peer reviewed papers in top international journals. Yet, what is published in these journals often resonates best with the academic community itself. The academic "matters of concern" are making a piece of writing relevant to a global research community, or to funding bodies concerned with certain definitions of relevance and impact. Thus, the totalizing stories of the Brexit and Trump movements are not necessarily countered by rich accounts of diversity and specificity from scholarly voices, but just as often with other totalizing narratives about what it means to produce solid knowledge, what it means to be a good scientist, and how "science" and "society" relates to each other. Narratives about making nations "great" and making science "excellent" both narrow down, rather than open up for potential futures.

Thus, while "Science" seems to have lost interest in the local, specific, peculiar, strange and weird, it is probably from time- and space-specific places and issues that support for grand movements and narratives like "Trump" and "Brexit" emerges. This implies that

in the years ahead, there is a need both to "zoom in" and to "zoom out", to study and understand collectives of different sizes, in order to avoid being shocked as we have been this year. It seems that we should work to re-award status to the weird or remarkable to complement the current focus on the generalizable and universal.

STS is particularly well equipped to take up this challenge, and the Nordic Journal of Science and technology studies will remain dedicated to the publication of scholarship that probes the many links between the local and global, the specific and the general, the empirical and theoretical. Recent events have shown that to understand the world, one must understand the weird, but also the relationships between different kinds of weirds and weird-world links.

This issue includes four peer reviewed articles, that all focus on highly specific empirical topics, yet remain able to link these specificities to broader phenomena. Two papers deal with how experts relate to categories like "the public" in their output. Per Hetland studies the differences in the ways journalists and researchers popularize technological change. Researchers, he finds, tend to focus on the observable, which translates into relatively stable narratives. Journalists, on the other hand, create narratives anchored in future expectations, which means that they are more prone to write dramatic stories about change and turmoil.

Erik Thorstensen explores the language of the IPCC Working Group III's latest report, on mitigation of climate change, in order to try to understand if the IPCC attributes different meanings to concepts like "citizens", "stakeholders", "laypeople" and "the public". The public, he finds, is largely treated as a barrier to progress, which need to be overcome if climate mitigation measures are to succeed. As such, the IPCC also produces a very narrow image of who people are, and what their roles are in climate mitigation.

Lene Pettersen looks at the use of social enterprise media in big organization, with a particular focus on how such software caters for the interpretation of space, and the logics of social interaction built into it. Pettersen illustrates how the logics of such platforms collide with, or work against the logics of similar tasks in the physical world, such as conversations and orientation in space.

Finally, Jenny Melind Bergschöld studies the use of a so-called vehicle-route problem solver (VRP) in the Norwegian home care service. This technology is meant to produce geographically optimal driving routes for care workers who drive from home to home. By applying the domestication perspective, Bergschöld shows how the technology "malfunctions", in the sense that it does not perform as expected, but also that it takes on different meanings in the everyday life of the care givers.

The Nordic Journal of Science and Technology Studies is likely to remain a space for the publication of diverse STS-scholarship also in 2017. Some will say that this makes the journal weird. Weird, however, does not mean irrelevant, it implies a different sort of relevance than the instrumental kind forced on scholars through slogans of excellence. Weird implies taking what goes on in the world seriously, looking closely, and allowing oneself to become surprised by what is actually happening. This is probably also our best bet if we want to be politically relevant in the years ahead.

NORDIC JOURNAL
of Science and Technology Studies

PUBLIC COMMUNICATION OF TECHNOLOGICAL CHANGE

Modest and Less Modest Witnesses

by Per Hetland

When journalists popularize a highly topical new technology, such as the Internet, they situate their popularization within technological expectations; when researchers popularize it, they situate their popularization within both a retrospective and prospective understanding of technological change. Following this, journalists are inclined to appeal to emotionally involved users or pioneers, and researchers are inclined to appeal to responsible citizens. Hence, journalists immodestly dramatize the future by boosting a new technology or turning its risks into threats, while researchers acting as "modest witnesses" pour oil in troubled waters, indicating skepticism about the journalistic approach. Consequently, the technology popularization field is structured in two dimensions: from public appreciation of technology via public engagement to critical understanding of technology in public, and from expectation-based argumentation to research-based argumentation.

Keywords: modest witness, popularization, technological change, expectations, Internet

Author: Per Hetland
Department of Education,
University of Oslo
per.hetland@iped.uio.no

Introduction

Science, technology, and public enlightenment are crucial elements of the modern project. As a forerunner of the modern project, academia includes education, scientific research, and the public communication of science and technology (PCST) as its three most prominent assignments. The third assignment, PCST, refers to all science and technology "mediation, interpretation, dissemination and explanation activities – the range of efforts, among others, to inform, sensitize and mobilize the public" (Schiele and Landry 2012[r], 34). Professional communicators, such as journalists, public relation officers, museum curators, and teachers play crucial roles in mediating science and technology to various publics. However, sometimes researchers choose a direct route, presenting scientific research to various publics via, for example, feature articles, textbooks, or public lectures (Bucchi 1998[r]; Bucchi and Trench 2008[r]; Cheng, et al. 2008[r]; Fleck 1935/1979[r]; Lewenstein 1995[r]). Thus, this article sets out to explore how researchers differ from journalists in the way they portray technological change when they popularize research about the Internet.

While science and technology journalists look for news value to attract their publics' attention or "increase relevance and comprehensibility" for non-scientists (Peters 2013[r], 14107), it seems that most researchers communicating their research act as "modest witnesses" to calm exaggerated expectations (Allan, Anderson, and Petersen 2005[r]; Dunwoody 1999[r]; Gunter, Kinderlerer, and Beyleveld 1999[r]; Haraway 1997[r]; Shapin 1984[r]; Shapin and Schaffer 1985[r]). There is much evidence to indicate that these differences are embedded in the respective occupational sub-cultures:

> The professional identity strategies deployed by scientists such as requiring journalists to adhere to scientific norms and discourse are firmly grounded in the material practices, literary style and social technologies of Boyle's "modest witness". These contrast sharply with journalists' attempts to deal creatively with esoteric knowledge in the interests of democratization, editorial approval and organizational constraint. (Reed 2001[r], 295)

Consequently, one may claim that these differences are part of two different "professional projects" depicted in the two faces of witnessing (Peters 2001[r]): direct experience of a sociotechnical practice, and discourse about the practice to publics not present. While researchers are scientific witnesses observing sociotechnical practices, journalists report on sociotechnical practices experienced by others. However, very few scientists "have 'seen for themselves' or 'directly witnessed' the experiments, the proofs, or even the raw data that support scientific claims. Scientific testimony, then, is usually a double-mediation" (Leach 2009[r], 183-184).

Within science and technology journalism in Norway, the Internet has been popularized according to two cultural master frames or master narratives: the utopian master narrative that contains the pro-innovation position (Hetland 2015[r]) and the technology-as-risk master narrative that contains the control position (Hetland 2012[r]). These two master narratives are well known in PCST (Perrault 2013[r]). However, seldom are the master narratives dominating science and technology journalism compared with the master narratives popularly used by researchers as authors. A study of how climate science is presented in Norwegian newspapers compared the master narratives of journalists with those of researchers and found that, while journalists dramatize, researchers try to avoid over-dramatizing (Ryghaug 2006[r]). Researchers find popularization important; however, they are troubled by journalists' preoccupation with sensationalism and being overly dramatic (Carlsen, Müftüoglu, and Riese 2014[r]; Gunter, Kinderlerer, and Beyleveld 1999[r]; Petersen et al. 2009[r]; Ryghaug 2006[r]).

The dominant view of popularization from the 1990s stated that it involved at best "appropriate simplifications" for the lay public (Hilgartner 1990[r]; Suerdem et al. 2013[r]). PCST is perhaps the area in which the linear communication model is most clearly reflected. This strong position of the linear model is likely linked to the scientist's role as a teacher and to the motive for educating the public (Peters 1995[r]). "Obviously, experts in many cases want to take the translator role on themselves while journalists assume this role to be theirs" (Peters 1995[r], 43). However, the relationship between science, technology, and the media is changing. The importance of the media in technoscience is intensifying, even if the media may have less influence on technoscience than on other parts of society. Consequently, the technosciences' media connection also has important repercussions (Rödder, Franzen, and Weingart 2012[r]).

Technoscientific issues that the public experiences as transformative will typically appeal to various publics and to different stakeholders and will most likely be used to test established boundaries. This is especially true when the technoscientific innovation reconfigures the human communication environment. The public's sensitivity to different technoscientific issues may also vary greatly. Some issues are "hot" even before they are placed on the mass-media agenda (Callon 1998[r]; Epstein 1996[r]). In a discussion about the "threat society" and the media, Nohrstedt (2010[r], 26, emphasis in original) claimed that "*when a risk is politicized, it tends to be formulated as a threat*." Threats therefore exploit people's uncertainty and anxiety. This distinction is interesting and gives the media an important role, elucidated by the concepts of *mediation and mediatization* (Ampuja, Koivisto, and Väliverronen 2014[r]). According to Nohrstedt, while mediation implies dissemination of information, mediatization implies "something more, namely, that the problem or danger is created *in and by* the media" (2010[r], 41, emphasis in original). The different master narratives and their accompanying positions may therefore also be examples of mediatization processes in and by the media. People are

often not aware of problems or opportunities before the media dramatize them and give them content. Mediatization of an issue "implies that its representation is changed into a form that suits media interest best, and that journalists as professionals are best at, namely to get public attention through emotional messages, dramatic angles and visual images" (Nohrstedt 2010[r], 26). This discursive practice also represents a move away from "reasoned argument" (Davies 2014[r]).

The public communication of scientific and technological knowledge will be studied with the overall aim of understanding how researchers differ with journalists in the way they portray technological change when they popularize research about the Internet. The first part of the article is a theoretical discussion that provides an overview of popularization and the implications of retrospective and prospective understandings of technological change, including technological expectations; it aims to combine the two using framing theory. The second part discusses the methodology and then analyzes the case of popularization when researchers write in the mass media about a new technology, such as the Internet, focusing on researchers' feature articles (*kronikker*) in two national newspapers in Norway. The last part of the article summarizes the analysis and links it to the broader discussion of PCST.

Theoretical and Conceptual Issues

Concerning popular science rhetoric, Perrault (2013[r]) claims that science and technology are popularized according to three different models: public appreciation of science and technology (PAST), public engagement with science and technology (PEST), and critical understanding of science in public (CUSP). The PAST model is characterized by a one-way flow of information from the scientific sphere to the public, in which science is a black box, reading is uncomplicated, knowledge is boosted, and a deficit exists only on the reader's side. The PEST model conceives of PCST as a conversation open to dialogue; however, this model still separates science and society and locates the center of gravity in science. The CUSP model of PCST considers all the elements of science-in-society, including their interactions, to be worth scrutinizing. The CUSP model offers four advantages: First, it has a "relational" focus; second, expertise is multiple; third, it focuses on the twin duties of PCST to inform and educate while probing and criticizing; and fourth, it matches the reality of the public's views of science, which combines public enthusiasm and public criticism (Perrault 2013[r], 12–17). These three models imply three different roles for science and technology popularizers: boosters, translators, and critics. In this context, the CUSP model is of special relevance. Modern society increasingly relies on researchers as experts. Peters states that researchers as public experts combine two interesting aspects: researchers as (policy) advisors and researchers as public communicators (Peters 2014[r]). Expert advice may take the form of public dramas (Hilgartner 2000[r]) or technological dramas (Pfaffenberger 1992[r], 285). Pfaffenberger claims that a "technological drama is a discourse of technological 'statements' and 'counter-statements.'" Through this means, experts provide general knowledge and usually aim for rational decision making (Peters 2014[r]).

As mentioned above, Internet journalism has used two master narratives: the utopian master narrative that contains the pro-innovation position (Hetland 2015[r]) and the technology-as-risk master narrative that contains the control position (Hetland 2012[r]). Regarding the former, the research questions ask how different actors or chaperones are enrolled in popular texts to substantiate a specific framing in the portrayal of the Internet by the Norwegian press, how a position is transformed into a bias, and how such a bias is constituted. Regarding the second master narrative, the research questions ask how the expectancy cycles related to the Internet fluctuate in the mass media and how the narrative of control contribute to the domestication processes of the Internet. This is a study of 2,772 newspaper articles written by journalists about the Internet from the print editions of the Norwegian newspapers *Aftenposten* (morning edition; 1,334), *Dagbladet* (813), and *Dagsavisen* (625) from 1995 to 2006. The criteria for selecting an Internet article were those used by Bader (1990[r]) in a case study of articles on research. One of Bader's (1990[r]) criteria was that roughly half of the article should discuss the object of the study. Correspondingly, one criterion was that the Internet should be a central theme of the article; in other words, at least half of the selected article should deal with one or more sets of potentials or problems concerning the Internet. The selection of articles was also based on the following criteria: 1) the article has a word count of at least two hundred, 2) the Internet is mentioned in the headline or the introductory text, and 3) the text was written by a journalist — all types of journalists, not only science and technology journalists. Excluded from the text corpus were short news reports, editorials, debates, and feature articles by researchers and longer feature articles by journalists with a mix of positions. Over the twelve-year period studied; the pro-innovation position characterized 68.7 percent of news stories, while 31.3 percent of news stories were characterized by the control position. The pro-innovation position was promoted through either praise or blame, while the control position was promoted through individual, social, technological, and institutional control. The master narrative of control is an interesting example of how risks are politicized, in that the media not only formulate the threats but also their solutions. The same is true for the pro-innovation master narrative; the media not only formulate opportunities, but also promote them. A third master narrative would have been possible: the dystopian master narrative containing the anti-diffusion position. This master narrative is well known from the study of other technologies, such as nuclear

power or genetic engineering (Bloomfield and Doolin 2012[r]; Bauer 2015[r]). In a study of how journalists portray the Internet, however, it was not possible to find this master narrative in its pure form (Hetland 2012[r]). When it appeared, it was a position for which "others" were spokespersons, such as more totalitarian regimes.

The three master narratives are linked to anticipatory action, thereby creating expectations (Brown, Rappert, and Webster 2000[r]). Expectations usually have a temporal pattern (Borup et al. 2006[r]), which is well illustrated by the popularization of the Internet (Hetland 2012[r]). Expectations are important in order to "mobilize the future into the present" (Brown and Michael 2003[r]), and there is even a business in promoting technological expectations (Fenn 2007[r]; Pollock, and Williams 2010[r]). However, while expectations are future-oriented, influencing the shaping of technology and innovation, the scientific discourse of technological change tries to understand what has happened or might happen. Technological change is either understood as continuous, characterized by an on-going evolution, or as discontinuous, characterized by smaller and larger revolutions (Basalla 1988[r]; Bragesjö, Elzinga, and Kasperowski 2012[r]; Kuhn 2012[r]; Rogers 2003[r]). Thus, while the journalists often situate their arguments within a prospective understanding of technoscience with strong elements of what might be called "folk theories" (Brown, Rappert, and Webster 2000[r]; Green 2004[r]; Rip 2006[r]), researchers will usually situate their arguments within a scientific discourse. This article will study how retrospective and prospective understandings of technological change influence the roles of researchers as popularizers and expert witnesses. Expert witnesses do not mediate sensory experiences acquired by presence; they mediate the results of intellectual work (Peters 2011[r]). Consequently, the media play an important role in the production and circulation of knowledge and interpretations of science and technology (Hjarvard 2013[r]; Väliverronen 2001[r]). One may even claim that the media have become what Latour (1987[r]) calls an obligatory passage point for researchers that act as public intellectuals, some even becoming "celebrity scientists" (Fahy 2015[r]; Goodell 1977[r]; Kalleberg 2012[r]). "Public intellectuals do not work solely within a *professional culture* of other credentialed experts. They also work within a broader *public culture* that includes experts from other fields, journalists, writers, critics, and citizens" (Fahy 2015[r], 12, emphasis in original).

To study how researchers portray their and/or others' research about the Internet, the model that William A. Gamson and his colleagues (Gamson and Lasch 1983[r]; Gamson and Modigliani 1987[r]) constructed was adopted. The purpose of the model is to analyze how this repertoire is used to describe particular aspects of a phenomenon (see also Hetland 2012[r]; 2015[r]). The model has two principal constituents: frames and positions (Gamson and Modigliani 1987[r]). Metaphors, exemplars, catchphrases, depictions, and visual images are framing devices, whereas roots, consequences, and appeals are reasoning devices for a more general position (Gamson and Lasch 1983[r]). Chaperones—spokespersons, users, celebrities, witnesses, experts, and authorities—are enrolled in the text to support claims (Hetland 2015[r]; Morgan 2011[r]). This article is concerned with two crucial master narratives within PCST that are used on a wide array of technoscientific issues with wide cultural implications. One may even claim that they represent two well-embedded cultural narratives (Ihlen and Nitz 2008[r]). The two different understandings of technological change are dialectic. As Gamson and Modigliani (1989[r], 6) stated, "There is no theme without a countertheme." This countertheme or counterframe attempts to undermine or redefine the interpretative framework (Benford and Snow 2000[r]). While many of the framing devices are important for understanding popularization, the reasoning devices for a more general position are important for understanding the researchers' roles as expert witnesses. The core frame is essential to establish a relational focus with the reader and to inform and educate. The core position outlines the role of expertise, which may be a multifaceted rather than a unitary construct. In this respect, the root analysis will represent the underlying approach to technological change. The core position will also represent the expert advice offered by researchers. In this regard, contextualization and the production of socially robust knowledge (Gibbons 1999[r]; Nowotny, Scott, and Gibbons 2001[r]) are important elements of the core position.

Consequently, while the journalists often situate their popularization of technology within narratives of expectations, technology popularization by researchers is often situated within a more general discourse on technological change, making the role of the researcher resemble what Haraway (1997[r]) called a "modest witness," a guarantor of scientific validity. This guarantor role also makes the modest witness vulnerable if the claims are proven false (Haran and Kitzinger 2009[r]). Witnessing is about taking risks, since: "Witnessing is seeing; attesting; standing publicly accountable for, and psychically vulnerable to, one's visions and representations. Witnessing is a collective, limited practice that depends on the constructed and never finished credibility of those who do it …" (Haraway 1997[r], 267).

Journalists use researchers as expert witnesses to comment on on-going events in a complex society. Usually, journalists act as the initiators (Wien 2013[r]). Presently, in both Denmark and Norway, researchers from the social sciences and humanities are the dominant expert witnesses in the media (Carlsen, Müftüoglu, and Riese 2014[r]; Wien 2013[r]). An earlier study from Norway showed that in 1966 PCST was dominated by the natural sciences. By 2006, however, there was a more equal distribution between different academic disciplines (Andersen and Hornmoen 2011[r]). A meta-analysis of studies on the media's coverage of science, studying 215 publications selected from the Social Sciences Citation Index among a preliminary sample of more than 4,000 publications found that scholars mostly analyze media coverage of the natural sciences and neglect social sciences and humanities (Schäfer 2012[r], 658). On the other hand, studies indicate that the gap

between the humanities and social sciences and the media is much smoother than the gap between the natural sciences and the media (Peters 2013[r]). Research about the Internet in Norway involves a broad array of disciplines; thus, we will at least avoid the bias of focusing only on natural science in the media (Trench and Bucchi 2010[r], 2). Public attention to science and technology—or rather the various media's attention to science and technology—fluctuates over time. This fluctuation varies according to changing societal contexts and endogenous factors in the operations of technoscience (Bauer 2012[r]); issue-specific fluctuations are also linked to the domestication processes of specific technologies (Hetland 2012[r]).

Data and Methods

This article examines popularization when researchers write in the mass media about a new technology, such as the Internet, compared with journalists' popularization. The journalists' portrayal of technological change is presented in two earlier articles (Hetland 2012[r]; 2015[r]). Consequently, the present presentation of data and methods concerns researchers' feature articles in two national newspapers in Norway: *Aftenposten* and *Dagbladet*. A previous study of eighty-five feature articles written by researchers from the University of Oslo in the period from 2002 to 2003 indicates that about eighty percent of the feature articles have "research-based argumentation" (UiO 2004[r], 9). The remaining feature articles were mainly related to university or science policy. Research-based argumentation incorporates one's own or others' research into the text to support the arguments (Latour 1987[r]), and it is also important to look at popularizations in a similar manner (Kuhn 2012[r]). Although the feature articles were connected to current issues, they were marked by the researchers' disciplines (Løvhaug 2011[r]). Thus, for the present study, feature articles with research-based argumentation were selected.

Subsequently, as a study of journalistic texts, this paper applied the criteria from Bader's case study of research articles (Bader 1990[r]) to establish the requirements for qualifying a feature article as communicating research about the Internet. For this study, the criterion was that the Internet should be a central theme in the feature article. This meant that, as a rule, at least half the feature article took up one or more sets of prospects or problems concerning the Internet. Studies of Norwegian PCST for the period from 1998 to 2000 have estimated that each university faculty member wrote an average of 2.1 self-reported popular articles and made 1.4 self-reported contributions to public debate (Kyvik 2005[r]). However, during the selection of feature articles for further study, it was more or less impossible to distinguish between popular articles and contributions to debate, since most of the articles were a combination of both. If shorter letters to the editor had been included, it would have been easier to identify contributions to debate that were not also popularizations (Hetland 2002[r]).

The database Atekst (Retriever) was used to select the feature articles. From the many Norwegian newspapers contained in this database, *Aftenposten* and *Dagbladet* were selected. *Aftenposten* is Norway's largest newspaper and has been described as having an independent conservative orientation. *Dagbladet* is Norway's second largest tabloid newspaper and has been described as being liberal. Each day, both newspapers have a feature article written by an author not affiliated with the newspaper. The features are long, in-depth articles in which the author may address an interesting topic in about 6,000 characters (including spaces). Of the feature articles selected for this study, fifty were from *Aftenposten*, and thirty-six were from *Dagbladet*. The two newspapers publish an estimated[1] 5 – 15 percent of the feature articles they receive every day. These newspapers were selected because they have national coverage aimed at the general public, allow the longest feature articles, and were digitized for the period between 1995 and 2012[2]. All relevant feature articles on research about the Internet during the period studied were retrieved. The study covers eighty-six feature articles from 1995 to 2012. The author wrote one of the feature articles; however, it was not included among those selected for more detailed study.

Feature articles from Atekst were retrieved in several steps, using a selection procedure to ensure that all relevant feature articles were included. The search string "internett AND (placement: kronikk OR articletype: kronikk OR placement: debatt OR articletype: debatt) AND wc: >200" for the mentioned sources and period produced 1444 articles in June 2013. To limit the number of articles, each article had to have a word count of at least two hundred. Then, each article was screened individually. If a feature article conformed to the criteria discussed above (the author/s as researcher/s, research-based argumentation, and the Internet as a central theme of the feature article), it was included in the final text corpus. All the eighty-six selected feature articles were then transferred to HyperRESEARCH, a program for Computer Assisted Qualitative Data Analysis (CAQDAS). HyperRESEARCH is useful for organizing, managing, and analyzing a textual corpus of this size. First, each feature article was coded in an experimental manner to "think-up" from the data and facilitate a repeating comparison of the texts gathered (Hesse-Biber and Dupuis 2000[r]). *After* this first coding, all the eighty-six feature articles were coded according the following coding scheme (Table 1).

1 Personal communication with the two editors.

2 Dagbladet is only partly digitized for 1995, and I had to do a manual search to retrieve all relevant feature articles for that year.

Category	Variables/Dimensions
Newspaper	Aftenposten/Dagbladet
Author	Gender/Discipline/Affiliation
Topic	Internet Only/Internet and Social Media/Internet and Gaming
Chaperones	Number/Type/Role
Master Narrative	Pro-Innovation/Control/Anti-Diffusion
Reader Engagement	Emotional Messages/ Reasoned Arguments
Internet Publics	Users/Producers
Actors and Artifacts	Boundary Distinct/Blurred
Approach to Technological Change	Continuous/Discontinuous
Approach to Popularization	PAST/PEST/CUSP
Approach to Policy Advice	Specific/General

***Table 1**. Coding Scheme*

It is crucial to remember that the thematic focus of the selected feature articles is a result of both the messages that the researchers wish to convey and the editors' selection process. In this article, the focus will be on the actual texts. Writing up the three presentations "Technological Change Communicated," "Technological Change as Continuous," and "Technological Change as Discontinuous" enabled the sorting of cases and selection of typical and illustrative text elements for the analysis. Consequently, these three presentations will also explain the content of Table 1 in more detail. In Norway, the concept of PCST includes communication of the social sciences and humanities. The author did all the translations from Norwegian to English.

During the period studied, three large research programs from The Norwegian Research Council framed much of PCST activities deriving from information and communication technology (ICT) research. These programs have been crucial in setting the agenda for communicating research about the Internet and its relevance to Norwegian society. The first program was the *Social and Cultural Preconditions for ICT* (1998–2002). Among its objectives was "to develop knowledge and expertise improving public policy and the policy of industry concerning new ICT" (NFR 2003[r], 4). The second program was *Communication, ICT and Media* (2003–2007). This program called for research to be "action-oriented and contribute to policy making and public debate, providing input to the regulation, organization and coordination of ICT, telecom and media policy" (NFR 2002[r], 8). The third program was *Core Competence and Value Creation in ICT* (2005–2014). One of its objectives was to produce "research results that are used by trade and industry and that benefit the development of society" (NFR 2010[r], 5). All together, these three programs have funded close to four hundred projects, thereby strongly influencing the agenda of research about ICT and the Internet and, consequently, PCST within the same field.

Technological Change Communicated

The number of feature articles varied over time. Figure 1 illustrates the timeline pattern of feature articles communicating research about the Internet.

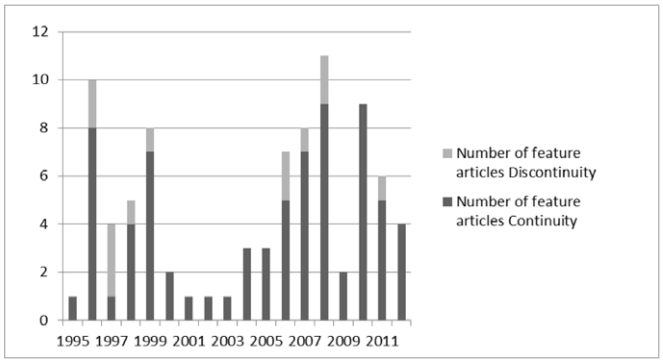


***Figure 1**. Number of feature articles from 1995 to 2012 (N=86).*

Two waves are identified. The first wave indicates the novelty of the Internet, while the second wave indicates the arrival of two new topics: social media and gaming. However, this article aims to study master narratives, not issue-specific narratives.

Popularization is done by presenting stories using a wide variety of elements. Some stories may contain all of these elements, and all stories contain some of these elements. The eighty-six feature articles have one or more authors and a total of 104 authors (counting repeat authors every time they appear). Ten of the authors have written more than one feature article. Of the total group of authors, 22.1 percent are from the science, technology, engineering, and mathematics (STEM) disciplines, including medicine; 68.3 percent are from the social sciences and humanities; and 9.6 percent are from law. Furthermore, 80.8 percent are men, while 19.2 percent are women. Finally, 77.9 percent are from the higher education sector, including all universities and university colleges,

while 22.1 percent are from the institute sector or other independent institutions. Chaperones are enrolled in the texts, and each feature article has an average of 3.6 chaperones. The chaperones mostly consist of references to scientific texts, in addition to research projects, policy papers, politicians, "the man on the street," and other participants in the public debate. Policy and politics are made relevant. However, it was clear from the first reading that, in general, researchers are rather soft-spoken when it comes to giving policy advice.

The following sections will examine how popularization is handled when technological change is understood first as continuous and second as discontinuous. The feature articles are classified into one of these two understandings, depending on how the authors framed technological change in the actual texts. About 85 percent of the feature articles framed technological change as continuous, while about 15 percent framed technological change as discontinuous.

Technological Change as Continuous

The first feature article in the sample that discussed the Internet was published in December 1995. In an article entitled "The Internet Is Far from Indispensable" (*Aftenposten*, 13.12.1995: 15), the two authors, both from the Department of Informatics at the University of Oslo, set out to "dispel the myth that if you as an individual are not connected to the Internet, you will be left behind in society." Authors adhering to continuity contrast their understanding with the understanding of technological change as discontinuous. One well-known participant in this debate stated in his feature article that, "In many comments, it may seem as if one perceives the Internet as a kind of volcanic land mass that blows up in international waters, a terra incognita where no law prevails, a kind of cybernetic counterpart to the lawless, Wild West. This is incorrect" (*Aftenposten*, 27.09.1996: 15). Within this understanding, the Janus face of technology is highlighted. On the one hand, the Internet represents new digital divides and facilitates different sorts of addictions and criminal acts. On the other hand, it is represented as important to use the Internet and to allow it to become a part of our literacy and institutions. The actors who use the Internet are understood as democratic participants, and there is a clear distinction between actors and artifacts. Some actors constitute a threat to democracy and to other users who follow social norms and Norwegian laws and regulations. However, these rules also apply to "villains" and the "addicted." New technology and digital literacy are increasingly used to regulate and control activities on the Internet and to handle different types of risks and challenges. All in all, it is the social life of "real life" that is important within the continuity perspective.

Within this frame, it is important that all citizens participate and have access to the public sphere and are not "duped by experts' fuzzy speech" (*Dagbladet*, 10.12.1996: 42). Open access to information is therefore vital. Since participation in public dialogue is important, several contributors emphasized that we are in no hurry to innovate because "as long as we try to be the very first in technological change, we have no way to take a break, and we end up as slaves instead of innovators" (*Dagbladet*, 25.08.1998: 3). The importance of expertise is often highlighted in the continuity argument, describing various challenges such as different types of addictions, crime, violence, parental regulation and control, access to information, information overload, commercialization, old and new monopolies, intellectual property rights, and user-unfriendly solutions. This view emphasizes the need to develop our expertise to handle these challenges both as users and as a society. Criticizing the technophiles is crucial, but public authorities do not do enough to face these challenges and to understand and solve the problems. On the one hand, the "Internet amplifies, makes invisible and promotes the power of the cultural elites" (*Dagbladet*, 27.11.1999: 52), while on the other hand, our politicians "confess a lack of knowledge" (*Dagbladet*, 19.04.2005: 38). New solutions should be user friendly; however, they are often the opposite. For example, the government is criticized for making its new public information service a "flop." One author claimed that the government "should find its place on Facebook" where the users are (*Dagbladet*, 13.10.2007: 48).

This view understands the risk of the Internet along a continuum from "the Net is not as dangerous as many believe" (*Aftenposten*, 02.01.2004: 12) to "the threat of a massive cyber-attack represents in many ways the quintessence of a global risk society" (*Aftenposten*, 13.12.2004: 8). Innovation, policy, and politics are often introduced as conflicting issues such as freedom and/or control, intellectual property rights and/or open access, and information and/or knowledge. Often, the author does not provide any concrete answer and instead appeals for more debate and more democracy. Society may also lack the necessary knowledge (or research) to make good decisions. Sometimes, the author provides more explicit policy advice, such as the need for more user-friendly technology, the need for more parental involvement, the importance of skilled use of cryptography, and the improvement of digital literacy. However, the policy advice provided is rather general and allows for a wide range of options. Underlying these proposals is the possibility of concretizing the policy options through a democratic process. Each feature article of the continuity type has an average of three chaperones enrolled in the texts.

Technological Change as Discontinuous

Authors adhering to discontinuity contrast their understanding with the understanding of technological change as continuous. Within discontinuity, opposing views are examples of technophobia that "permeates Norwegian society, and makes us unable to meet the challenges of the digital revolution" (*Dagbladet*, 29.02.1996: 34). Young people play an important role within this understanding, as they represent change and the future, and although they may become seduced and addicted, they generally represent positive values and constitute a "media lab for the future" (*Dagbladet*, 17.02.1997: 41). Here, technological change is understood as a series of revolutions. The revolutionary aspect means that the frames of

reference and rules change significantly. According to one author, "Modernity's relatively stable representation of identity is no longer adequate when the subject is played out in cyberspace. It is not fruitful to adopt an extremely optimistic or pessimistic attitude.... Information technology is decisive and penetrating – but the man on the street uses information technology in his own way" (*Dagbladet*, 15.03.1996: 34). Enrollment of actors is done by statements such as, "We are becoming citizens of the new Net community. We are all cyborgs (a mixture of human and machine) in love with our prostheses: computers, the Internet, and virtual reality," and "Those who can navigate the electronic highways will be the winners in the information society" (*Dagbladet*, 29.02.1996: 34). Consequently, the boundaries between actors and artifacts become blurred, and the artifacts become prostheses for the actors. Opposing actors are perceived as "Gutenberg's agents," promoting out-dated understandings. Within this framework, social life unfolds in cyberspace, and the users make their own rules.

Within this framework, the users are the experts who acquire their expertise by being active on the Internet. They "are not only innovators, but cultural shepherds" (*Aftenposten*, 22.07.1998: 11). Expertise is constituted by use and activity. To understand technology use, one must look to young people. New types of expertise are crucial, and young people are the forerunners in this respect. The researcher's role is to interpret the challenges we are facing, and the establishment is the target of criticism. ICT research is too technically oriented, and we lack competent people to handle the interface between users and technology. It is therefore important to partake in the development of the new society "by speculating about the kind of society that emerges ... [as] there is less danger of being overwhelmed when the questions arise in their full potential" (*Aftenposten*, 31.08.1997: 11). The different sectors of the public are not only users, but also producers within this new regime, and new skills are becoming more important. Statements such as, '"We must learn to navigate the culture's digital field" (*Dagbladet*, 29.02.1996: 34), "the man on the street uses information technology in his own way" (*Dagbladet*, 15.03.1996: 34) and "learning in the information society should be oriented towards a communicative competence and emphasize transformation, change and complexity" (*Dagbladet*, 17.02.1997: 41) imply the responsibility and creativity of users and indirectly imply the importance of the users' "digital literacy." The incentive is that new skills and competence might create competitive advantages. Young people are innovators and are often made into pioneers in a (post)modern society in which participation is important. The authors' approach to innovation is marked by statements such as "www might be a killer application" (*Dagbladet*, 15.03.1996: 34). An average of 6.9 chaperones are enrolled in the text of each feature article of the discontinuity type.

Discussion

This article set out to explore how researchers differ from journalists when popularizing Internet issues. The most important conclusion is that researchers situate their popularization in research-based argumentation framed by two opposing understandings of technological change, while journalists situate their popularization in argumentation framed by two opposing understandings of technological expectations. So, while most researchers emphasize "facts" as modest witnesses, journalists emphasize expectations, as media witnessing is not only about reporting on observations, but also about interpreting them. These two different "world views" also lead most researchers to emphasize continuity, while most journalists emphasize what is going to happen. Consequently, researchers' communications about research are quite modest and strongly influenced by continuity. Most researchers seem worried about the narratives promoted by journalists (and some of their colleagues) and many see it as their mission to present a more sober picture of technological change. However, some of the researchers adopt more "journalistic approaches" in their popularization activities, particularly regarding the understanding marked by discontinuity. This might, however, also represent a move away from purely "reasoned arguments" and towards a more engaging discursive practice (Davies 2014[r]). In general, it seems that while journalists dramatize, researchers try to avoid over-dramatizing (Carlsen, Müftüoglu, and Riese 2014[r]; Ryghaug 2006[r]). However, this is too simplistic a portrayal of the difference. Following the earlier theoretical discussion, the findings might be illustrated as in Figure 2.

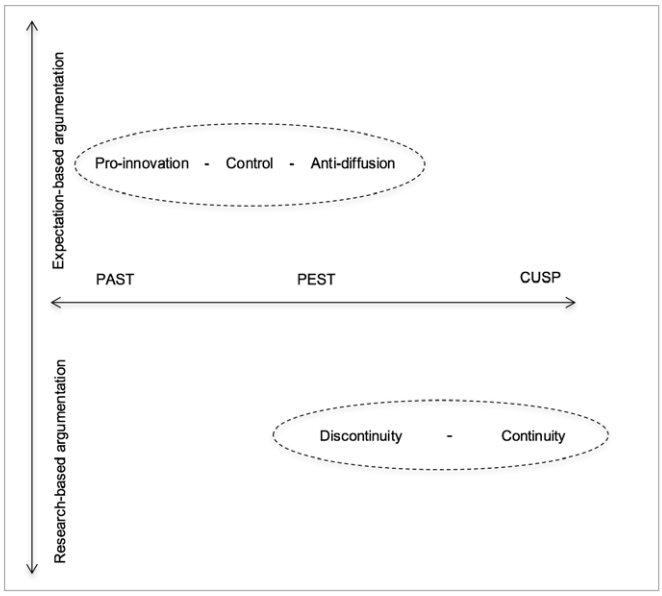


***Figure 2**. The technology popularization field.*

The technology popularization field is structured in two dimensions: (1) from public appreciation of technology (PAST) via public engagement (PEST) to critical understanding of technology in public (CUSP) and (2) from expectation-based argumentation to

research-based argumentation. While most journalists' contributions are situated closer to expectation-based argumentation, those of most researchers are positioned closer to research-based argumentation. Within the trichotomy of pro-innovation, control, and anti-diffusion, most journalists position their contributions close to the PAST model (the pro-innovation position), while some journalists position their contributions closer to the PEST and CUSP models (the control position). Along the dichotomy of discontinuity and continuity, most researchers position their contributions closer to the CUSP model (continuity), though some researchers position their contributions closer to the PEST model (discontinuity). One may consequently claim that mediatization processes are primarily driven by the media and not by researchers. Most researchers attempt to curb the mediatization processes acting as public intellectuals and do not aim for visibility for its own sake (Fahy 2015[r]; Goodell 1977[r]; Kalleberg 2012[r]); they are primarily concerned with communicating both reliable and socially robust knowledge (Nowotny, Scott, and Gibbons 2001[r]). Consequently, the role of the modest witness seems to be a crucial part of the professionalization of the research profession, and the "authority of the modest witness paradoxically stems from the appearance that authorship itself disappears" (Leach 2009[r], 189).

The strong standing of the role of the modest witness also makes the CUSP model the natural choice in science and technology communication. Including law, 77.9 percent of the researchers/authors are from the social sciences and humanities, and this certainly does not reflect the number of active researchers within the field. Either social sciences and humanities are more likely to be selected by editors, and/or they are simply more active in popularizing research and partaking in public debate, and/or writing feature articles is closer to their core activity. Another possible interpretation is that the modest witness has an even stronger stance within the natural sciences, and that being silent is the ultimate expression of this modesty. The fact that the social sciences and humanities, including law, are more active in science and technology mediation, interpretation, dissemination, and explanation activities is an important development in recent years. When it comes to communicating everyday technology compared with science, one aspect of witnessing may easily be overlooked. Both journalists and researchers are witnessing the diffusion of a new technology into society, and at the same time they are using the technology in question. This double perspective on witnessing may frame which questions are asked (Hetland 2002[r]) and how the two faces of witnessing are put into play. As mentioned, ten of the researchers have written more than one feature article. When interviewing six of the pioneer journalists within Internet journalism in Norway, several of them were concerned with the problem that some experts easily get "a season ticket from us and are allowed to speak again and again and again" (Hetland 2002[r], 118-119). One of the names mentioned was the late writer and law Professor Jon Bing, the only one of the feature article authors who had a name among a variety of publics and who was the closest to being a "celebrity scientist" (Fahy 2015[r]).

The two dominant understandings of technological change direct PCST along two different trajectories, and, as Pfaffenberger (1992[r], 285) claims, we experience a discourse of technological "statements" and "counterstatements." The most important distinctions between the continuity and discontinuity frames are found in their rhetorical approach toward technological innovations and their diffusion. While continuity emphasizes Internet participants as users and citizens in a deliberative democracy, discontinuity emphasizes them as pioneers and producers contributing, collaborating, or co-creating a new future. While continuity most clearly allows for a more critical understanding of technological change, discontinuity is usually positioned closer to public engagement with technology when it comes to understanding technological change. Green (2004[r]) outlined a model of the rhetorical theory of diffusion of innovations that emphasizes the number of justifications and the level of "taken-for-grantedness" supporting technological claims. Over time, the number of justifications decreases while the level of taken-for-grantedness increases (Green 2004[r], 656). One interpretation of this might be that when the "revolution" and "transition" become facts, what remains is normal science and puzzle-solving (Kuhn 2012[r]). However, this model must be understood in a given context. If, in their own view, the insiders promote an approach to diffusion of innovations that is controversial, the need for justifications is stronger. The discontinuity approach is more radical than the continuity approach, and resistance to it may be experienced as stronger. Insiders will therefore use stronger rhetorical tools to justify their claims by referring to more chaperones supporting the claims made. Thus, those arguing for continuity enrolled an average of three chaperones per feature article, whereas those arguing for discontinuity enrolled an average of 6.9 chaperones per feature article. A similar difference was found between the master narratives of pro-innovation and control in journalists' articles (Hetland 2015[r]), although it was not as distinct as the difference between the researchers' texts. In particular, those arguing for discontinuity present the readers of feature articles with arguments supported by a network of actors and artifacts. The chaperones bear witness to the claims made by both researchers and journalists.

As previously mentioned, utopian master narrative containing the pro-innovation position characterized 68.7 percent of the journalistic stories, and 31.3 percent of the stories were characterized by the technology-as-risk master narrative containing the control position. The dichotomy in researchers' portrayal of research about the Internet was instead marked by how to understand technological change. About eighty-five percent of the feature articles characterized technological change as continuous, while about fifteen percent characterized it as discontinuous. The third master narrative, the dystopian master narrative containing the anti-diffusion position, was not found in this study among either journalists or researchers. The conflict between continuity and discontinuity is most apparent when a new issue-specific frame arrives; consequently, discontinuity flourishes when it can ride a new wave of innovation. Researchers who adhere to continuity use discontinuity

as their counterframe, emphasizing that the competing master narrative represents a problem and/or misunderstanding and vice versa. Thus, the rhetoric used in the diffusion of innovations may also be perceived as an important element in what Rogers (2003[r]: 169) called the knowledge and persuasion stages. At the "knowledge stage," the individual is "exposed to the innovation's existence and gains an understanding of how it functions," while at the "persuasion stage," the individual forms a "favorable or unfavorable attitude towards the innovation." Apparently, the role of the less modest witness is more easily played both by journalists (Hetland 2012[r]) and by researchers at the knowledge stage, while the role of the modest witness is played at all stages and increases in strength toward the confirmation stage.

Competing for grants from The Norwegian Research Council, researchers may see the role of a modest witness as important for professional success, because feature articles not only communicate downstream (toward the more "popular" publics), but also upstream (toward fellow researchers and the actors shaping the scientific research agenda). According to Haraway (1997[r]), the modest witness offers epistemological and social power to those who embody it, including recognition and perhaps public funding for research. However, fifteen percent of the feature articles were framed in a less modest way. One reason for this may be that there is no consensus among researchers about the importance of the modest witness. Some researchers may perceive it as important to be less modest, simply because they find what they describe as "technophobia" problematic; they see the new technology as decisive and believe it is important to partake in the development process in a more radical manner. As with the rationale behind the modest witness, one can also claim that being a less modest witness might pay off for those competing for research grants and research contracts from other public entities as well as the private sector. This is especially true since the field of Internet and ICT research involves both more funding by actors outside the traditional academic arena and a greater variety of funding options within The Norwegian Research Council.

Finally, another aspect of popular science that "troubles" some of the authors is underlined by Fleck's (1935/1979[r]: 115, emphasis in original) understanding of "textbook science" as *"[c]ertainty, simplicity, vividness originat[ing] in popular knowledge"*. That is where the expert obtains his faith in this triad of knowledge. Therein lies the general epistemological significance of popular science." Popular narratives may consequently be perceived as a battle between different views about what is going to count as valid knowledge. Thus, some researchers are troubled by researchers acting as modest witnesses, since the role of modest witness also might exemplify a conservative element within present academia. "Modesty" implies a diminishment of the revolutionary aspects of technological change and the fact that some technological innovations are disruptive. Researchers adhering to both continuity and discontinuity focus on the twin duties of PCST to inform and educate while probing and criticizing (Perrault 2013[r]). However, the polarized framing of continuity versus discontinuity hardly informs and enlightens readers about Internet innovations and their consequences.

The two different understandings of technological change also guide the need for expertise along two different trajectories. Within the continuity frame, the need for expertise is perceived as less urgent. Policy advice is therefore often limited to encour aging debate and an active deliberative democracy. Within the discontinuity frame, users' roles are perceived as more important in shaping a new technology. Yet here, too, researchers are rather soft-spoken about specific policy advice; in this respect, they also adhere to the ideal of the modest witness. Being a witness is about taking risk, and this is most apparent when giving policy advice – thus both groups of researchers minimize risk taking. Reading the three research programs' emphasis on policy development, the space for being less modest is most likely larger than either groups of researchers experienced. The CUSP model aims to inform and criticize; however, sometimes the critical approach creates barriers to a more informed learning process. Consequently, the critical approach must be matched with a more constructive approach that gives the reader a better understanding of technological change in general.

Acknowledgement
I am most grateful to Joan Leach at the Australian National Centre for the Public Awareness of Science, as well as the two anonymous reviewers, for their helpful comments to earlier versions of this article.

Per Hetland (PhD) is Associate Professor at the Department of Education, University of Oslo. His research activities cover four research fields: a) public communication of science and technology, b) design, development, and use of information and communication technology, c) studies in innovation, research and education, and d) local employment systems and informal learning.

References

Allan, Stuart, Alison Anderson, and Alan Petersen. 2005. "Reporting Risk: Science Journalism and the Prospect of Human Cloning." In Risk, Trust and Uncertainty, edited by Sean Watson and Anthony Moran, 165–180. London: Palgrave.

Ampuja, Marko, Juha Koivisto, and Esa Väliverronen. 2014. "Strong and Weak Forms of Mediatization Theory: A Critical Review." Nordicom Review 35 (Special Issue): 111–123.

Andersen, Elisabeth K., and Harald Hornmoen. 2011. "Mediating Science in Norway: Practices and Transformations in Major Newspapers." Media Transformations 5: 88–104.

Bader, Renate G. 1990. "How Science News Sections Influence Newspaper Science Coverage—A Case Study." Journalism

Quarterly 1: 88–96.
Basalla, George. 1988. The Evolution of Technology. Cambridge: Cambridge University Press.
Bauer, Martin W. 2012. "Public Attention to Science 1820-2010—A 'Longue Durée' Picture." In The Sciences' Media Connection - Public Communication and its Repercussions, edited by Simone Rödder, Martina Franzen and Peter Weingart, 35–57. Dordrecht: Springer.
Bauer, Martin W. 2015. Atoms, Bytes & Genes—Public Resistance and Techno-scientific Responses. New York: Routledge.
Benford, Robert D., and David A. Snow. 2000. "Framing Processes and Social Movements: An Overview and Assessment." Annual Review of Sociology 26 (1): 611–39.
Bloomfield, Brian P., and Bill Doolin. 2012. "Symbolic Communication in Public Protest Over Genetic Modification: Visual Rhetoric, Symbolic Excess, and Social Mores." Science Communication 35 (4): 502–527.
Borup, Mads , Nik Brown, Kornelia Konrad, and Harro van Lente. 2006. "The Sociology of Expectations in Science and Technology." Technology Analysis & Strategic Management 18 (3–4): 285–298.
Bragesjö, Fredrik, Aant Elzinga, and Dick Kasperowski. 2012. "Continuity or Discontinuity? Scientific Governance in the Pre-History of the 1977 Law of Higher Education and Research in Sweden." Minerva 50: 65–96.
Brown, Nik, and Mike Michael. 2003. "A Sociology of Expectations: Retrospecting Prospects and Prospecting Retrospects." Technology Analysis & Strategic Management 15 (1): 3–18.
Brown, Nik, Brian Rappert, and Andrew Webster. 2000. Contested Futures. A Sociology of Prospective Techno-Science. Aldershot: Ashgate.
Bucchi, Massimiano. 1998. Science and the Media. Alternative Routes in Scientific Communication. London: Routledge.
Bucchi, Massimiano, and Brian Trench, eds. 2008. Handbook of public communication of science and technology. Milton Park: Routledge.
Callon, Michel. 1998. "An Essay on Framing and Overflowing: Economic Externalities Revisited by Sociology." In The Laws of the Market, edited by Michel Callon, 244–269. Oxford: Blackwell Publishers.
Carlsen, Benedicte, Ingrid B. Müftüoglu, and Hanne Riese. 2014. "Forskning i media: Forskere om motivasjon og erfaringer fra medieintervjuer." Norsk medietidsskrift 21 (3): 188–208.
Cheng, Donghong, Michel Claessens, Nicholas R.J. Gascoigne, Jenni Metcalfe, Bernard Schiele, and Shunke Shi, eds. 2008. Communicating Science in Social Contexts: New models, new practices. New York: Springer Science+Business Media B.V.
Davies, Sarah R. 2014. "Knowing and Loving: Public Engagement beyond Discourse." Science & Technology Studies 27 (3): 90–110.
Dunwoody, Sharon. 1999. "Scientists, Journalists, and the Meaning of Uncertainty." In Communicating Uncertainty: Media Coverage of New and Controversial Science, edited by Sharon M. Friedman, Sharon Dunwoody and Carol L. Rogers, 59–80. New York: Lawrence Erlbaum.
Epstein, Steven. 1996. Impure Science—AIDS, Activism, and the Politics of Knowledge. Berkeley: University of California Press.
Fahy, Declan. 2015. The New Celebrity Scientists: Out of the Lab and into the Limelight. Lanham: Rowman & Littlefield.
Fenn, Jackie, and Mark Raskino. 2007. Understanding Gartner's Hype Cycles. Gartner Inc.
Fleck, Ludwik. 1935/1979. Entstehung und Entwicklung einer wissenschaftlichen Tatsache: Einführung in die Lehre wom Denkstil und Denkkollektiv (Eng. tr. Genesis and Development of a Scientific Fact). Chicago: University of Chicago Press.
Gamson, William A., and Kathryn E. Lasch. 1983. "The Political Culture of Social Welfare Policy." In Evaluating the Welfare State: Social and Political Perspectives, edited by Shimon E. Spiro and Ephraim Yuchtman-Yaar, 397–415. Paris: Academic Press.
Gamson, William A., and Andre Modigliani. 1987. "The Changing Culture of Affirmative Action." Research in Political Sociology 3: 137–77.
Gamson, William A., and Andre Modigliani. 1989. "Media Discourse and Public-Opinion on Nuclear-Power. A Constructionist Approach." American Journal of Sociology, 95(1): 1–37.
Gibbons, Michael. 1999. "Science's New Social Contract with Society." Nature 402 (Supp): c81–c84.
Goodell, Roe. 1977. "The Visible Scientists." The Sciences 17 (1): 6–9.
Green, Sandy E. 2004. "A Rhetorical Theory of Diffusion." Academy of Management Review 29 (4): 653–669.
Gunter, Barrie, Julian Kinderlerer, and Deryck Beyleveld. 1999. "The Media and Public Understanding of Biotechnology: A Survey of Scientists and Journalists." Science Communication 20 (4): 373–394.
Haran, Joan, and Jenny Kitzinger. 2009. "Modest Witnessing and Managing the Boundaries between Science and the Media: A Case Study of Breakthrough and Scandal." Public Understanding of Science 18 (6): 634–652.
Haraway, Donna J. 1997. Modest_Witness@Second_Millenium. FemaleMan©_Meets_OncoMouse? New York: Routledge.
Hesse-Biber, Shalene, and Paul Dupuis. 2000. "Testing Hypotheses on Qualitative Data: The Use of HyperResearch Computer-Assisted Software." Social Science Computer Review 18 (3): 320–328.
Hetland, Per. 2002. "Unmasking the Net: When Technology Communication Turns to the Public." Nordicom Review 23 (1–2): 109–124.
Hetland, Per. 2012. "Internet between Utopia and Dystopia: The Narratives of Control." Nordicom Review 33 (2): 3–15.
Hetland, Per. 2015. "Popularizing the Internet: Traveling Companions Supporting the Good News." Nordicom Review 36 (2): 157–171.
Hilgartner, Stephen. 1990. "The Dominant View of Popularization: Conceptual Problems, Political Uses." Social Studies of Science 20 (3): 519–539.
Hilgartner, Stephen. 2000. Science on Stage: Expert Advice as Public Drama. Stanford: Stanford University Press.
Hjarvard, Stig. 2013. The Mediatization of Culture and Society. London: Routledge.
Ihlen, Øyvind, and Mike Nitz. 2008. «Framing Contests in Environmental Disputes: Paying Attention to Media and

Cultural Master Frames.» International Journal of Strategic Communication 2 (1): 1–18.

Kalleberg, Ragnvald. (2012). Sociologists as Public Intellectuals and Experts. Journal of Applied Social Science, 6(1), 43–52.

Kuhn, Thomas S. 2012. The Structure of Scientific Revolutions. Chicago: The University of Chicago Press.

Kyvik, Svein. 2005. "Popular Science Publishing and Contributions to Public Discourse among University Faculty." Science Communication 26 (3): 288–311.

Latour, Bruno. 1987. Science in Action: How to Follow Scientists and Engineers through Society. Milton Keynes: Open University Press.

Leach, Joan. 2009. "Scientific Witness, Testimony, and Mediation." In Media Witnessing: Testimony in the Age of Mass Communication, edited by Paul Frosh and Amit Pinchevski. London: Palgrave Macmillian.

Lewenstein, Bruce. 1995. "Science and the Media." In Handbook of Science and Technology Studies, edited by Sheila Jasanoff, Gerald E. Markle, James C. Peterson and Trevor Pinch, 343–359. Thousand Oaks, CA: Sage.

Løvhaug, Johannes W. 2011. "Overlæreren i rampelyset: Universitetet i mediesamfunnet 1970–2011." In Universitetet i Oslo 1811–2011, edited by John P. Collett. Oslo: UNIPUB.

Morgan, Mary S. 2011. "Travelling Facts." In How Well Do Facts Travel?, edited by Peter Howlett and Mary S. Morgan, 3–39. Cambridge: Cambridge University Press.

NFR. 2002. Kommunikasjon, IKT og medier (KIM): Programplan. Oslo: The Norwegian Research Council.

NFR. 2003. Samfunnsmessige og kulturelle forutsetninger for IKT (SKIKT): Programstyrets egenevaluering. Oslo: The Norwegian Research Council.

NFR. 2010. Programplan 2005-2014 (Revidert februar 2010): Kjernekompetanse og verdiskaping i IKT - VERDIKT. Oslo: The Norwegian Research Council.

Nohrstedt, Stig A. 2010. "Threat Society and the Media." In Communicating Risks: Towards the Threat Society?, edited by Stig A. Nohrstedt, 17–51. Gothenburg: Nordicom.

Nowotny, Helga, Peter Scott, and Michael Gibbons. 2001. Re-thinking Science: Knowledge and the Public in an Age of Uncertainty. Cambridge: Polity Press.

Perrault, Sarah T. 2013. Communicating Popular Science: From Deficit to Democracy. New York: Palgrave Macmillan.

Peters, Hans P. 1995. "The Interaction of Journalists and Scientific Experts: Co-operation and Conflict between Two Professional Cultures." Media, Culture & Society 17 (1): 31–48.

Peters, Hans P. 2013. "Gap between Science and Media Revisited: Scientists as Public Communicators." PNAS 110 (Suppl 3): 14102–14109. doi: 10.1073/pnas.1212745110.

Peters, Hans P. 2014. "Scientists as Public Experts." In Routledge Handbook of Public Communication of Science and Technology, edited by Massimiano Bucchi and Brian Trench, 70–82. London: Routledge.

Peters, John D. 2001. "Witnessing." Media, Culture & Society 23 (6): 707–723.

Peters, John D. 2011. "An Afterword: Torchlight Red on Sweaty Faces." In Media Witnessing: Testimony in the Age of Mass Communication, edited by Paul Frosh and Amit Pinchevski, 42–48. London: Palgrave Macmillian.

Petersen, Alan, Alison Anderson, Stuart Allan, and Clare Wilkinson. 2009. "Opening the Black Box: Scientists' Views on the Role of the News Media in the Nanotechnology Debate." Public Understanding of Science 18 (5): 512–530.

Pfaffenberger, Bryan. 1992. "Technological Dramas." Science, Technology & Human Values 17 (3): 282–312.

Pollock, Neil, and Robin Williams. 2010. "The Business of Expectations: How Promissory Organizations Shape Technology and Innovation." Social Studies of Science 40 (4): 525–548.

Reed, Rosslyn. 2001. "(Un-)Professional Discourse? Journalists' and Scientists' Stories about Science in the Media." Journalism 2 (3): 279–298.

Rip, Arie. 2006. "Folk Theories of Nanotechnologists." Science as Culture 15 (4): 349–365.

Rogers, Everett M. 2003. Diffusion of Innovations. New York: Free Press.

Ryghaug, Marianne. 2006. "Some Like it Hot" - Konstruksjon av kunnskap om klimaendringer i norske aviser." Norsk Medietidsskrift 13 (3): 197–219.

Rödder, Simone, Martina Franzen, and Peter Weingart, eds. 2012. The Sciences' Media Connection—Public Communication and its Repercussions. Dordrecht: Springer.

Schiele, Bernard, and Anik Landry. 2012. "The Development of Science Communication Studies in Canada." In Science Communication in the World: Practices, Theories and Trends, edited by Bernard Schiele, Michel Claessens and Shunke Shi, 33–64. Dordrecht: Springer.

Schäfer, Mike S. 2012. "Taking Stock: A Meta-analysis of Studies on the Media's Coverage of Science." Public Understanding of Science 21 (6): 650–663.

Shapin, Steven. 1984. "Pump and Circumstance: Robert Boyle's Literary Technology." Social Studies of Science 14: 481–520.

Shapin, Steven, and Simon Schaffer. 1985. Hobbes, Boyle, and the Experimental Life. Princeton: Princeton University Press.

Suerdem, Ahmet, Martin W. Bauer, Susan Howard, and Luke Ruby. 2013. "PUS in Turbulent Times II—A Shifting Vocabulary that Brokers Inter-disciplinary Knowledge." Public Understanding of Science 22 (1): 2–15.

Trench, Brian, and Massimiano Bucchi. 2010. "Science Communication, an Emerging Discipline." Journal of Science Communication 9 (3): 1–5.

UiO. 2004. Formidling som Teller. Drøftingsnotat om Insentiver for Forskningsformidling. Oslo: University of Oslo.

Väliverronen, Esa. 2001. "From Mediation to Mediatization: The New Politics of Communicating Science and Biotechnology." In The Politics of Public Issues, edited by Ullamaija Kivikuru and Tarja Savolainen, 157–177. Helsinki: Department of Communication, University of Helsinki.

Wien, Charlotte. 2013. "Formidlere af faglige fakta eller samfundsdebattører? Om forskernes rolle i nyhedsmedierne." Nordicom Information 35 (1-2): 21–35.

NORDIC JOURNAL
of Science and Technology Studies

AGENCY AND CLIMATE CHANGE

A quantitative-structuralist approach to the assignment of moral agency in mitigation

by Erik Thorstensen

This article uses the IPCC Working Group III's latest report on mitigation of climate change as its material. The ambition is to investigate how the IPCC assigns moral agency to non-experts. For this, the article analyzes whether the terms "citizens", "stakeholders", "the public" and "laypeople" are presented as barriers to, drivers of or neutral towards mitigation measures. The "public" stand out in the IPCC report as a much larger barrier to mitigation than the other groups. This article relates these finding to work conducted by Brian Wynne (1991[r]) and Mike Michael (2009[r]) regarding perception of the public by scientific assessments. This article documents that the IPCC Working Group III tends to replicate stereotypes of the public from such scientific assessments.

Keywords: Climate policy, IPCC, Mitigation, Structuralism, Greimas

Author: Erik Thorstensen,
Centre for welfare and labour research
Oslo and Akershus university college of applied sciences
Erik.Thorstensen@afi.hioa.no

Introduction

Many love and value the stories of Alice in Wonderland by Lewis Carroll. Of particular interest for those of us with a penchant towards meaning and language, we hold the meeting with Humpty Dumpty in *Through the Looking-Glass* as one of the acmes.

> *"I don't know what you mean by 'glory'" Alice said.*
>
> *Humpty Dumpty smiled contemptuously. "Of course you don't - till I tell you. I meant 'there's a nice knock-down argument for you!'"*
>
> *"But 'glory' doesn't mean 'a nice knock-down argument,'" Alice objected.*
>
> *"When I use a word," Humpty Dumpty said in a rather scornful tone, "it means just what I choose it to mean - neither more nor less."*
>
> *"The question is," said Alice, "whether you can make words mean so many different things."*
>
> *"The question is," said Humpty Dumpty, "which is to be master - that's all."*

(Carroll 1893[r], 181–182)

Without consenting to Humpty Dumpty's general position towards language, I wish in this paper to explore how the terms "citizens", "stakeholders", "the public" and "laypeople" are used in the last report by IPCC's Working Group III, *Mitigation* 2014, as barriers to or resources for mitigation. The IPCC Working Group III provides an overview of mitigation options. These options will then be considered by political institutions that can position themselves towards the different suggestions, and then decide on a course of action. I will argue that the usage gives meaning to the words and that this is relevant because the IPCC has a powerful position and its findings are widely communicated and the meaning given by the IPCC to these terms taps into a tradition of practice when giving content to these terms. I try to understand if the IPCC WG III has a world-view – and how this world-view conceives "citizens", "stakeholders", "the public" and "laypeople". This is important because the IPCC WGs all provide input to politicians and policymakers.

Theoretical considerations

Bruno Latour (2005[r], 53) differentiates between the linguistic expression of agency and actual agency. The linguistic expression, the *figuration* of agency, is that which "is always provided in the account with some flesh and features that make them have some form or shape, no matter how vague" (2005[r], 53). Latour draws upon the notion of *actants* in the texts. These actants "operate on the level of function, rather than content" (Hawkes 2003[r], 70–71) and "the deep structure of the narrative generates and defines its actants at a level beyond that of the story's surface content" (Hawkes 2003[r], 71).

According to the insights provided by Vladimir Propp (1968[r]; 1984[r]) and elaborated by Algirdas Greimas (1966a[r], 1966b[r]), there can be said to be a finite number of possible elements present in narratives – and the combination of these makes the text into stories. Greimas studied the oppositional pairs between actants. In texts, all actants are present as actors that fulfill the functions of actants (Budniakiewicz 1992[r]). He saw three sets of oppositions as then revealing the deeper structure. The three sets are:

1) Subject vs. Object
2) Sender vs. Receiver
3) Helper vs. Opponent

According to Greimas (1966b[r]), there is no need for these actants to be physical persons, but they can take on the shape of more abstract forces. In this article, I will see if it makes sense to analyze how "citizens", "stakeholders", "the public" and "laypeople" function as Helper vs. Opponent in the IPCC WG III Mitigation 2014. In the Greimasian textual universe, the Helper is the one – or the ones – who facilitate and aid the Subject in reaching its goal, whereas the Opponent is the one obstructing this quest. The Subject consequently has a project or a task to fulfill – and this task constitutes the Object. On a superior level, Greimas postulates that there is a Sender, whose function is to see to it that the Subject reaches its Object, and a Receiver, who is the one to benefit from the Object and keeps the Object in its possession.

According to the political analysis done by Jorge Palma, it is in the third oppositional pair we can see an "axis of power" (1990[r], 19). Palma sees the opponent as everyone opposing the Subject's power – and through this the Opponent becomes the anti-Subject. Here, we again encounter Humpty Dumpty's assertion "The question is which is to be master – that's all."

As an illustration, I can show how Greimas applies his structural text analysis on Marxist philosophy history. Here, the actor Man fulfills the actant function Subject who is striving to reach the Object, which in Marxist thinking is Classless society, on behalf of Humanity in order to fulfill the destiny of History. The Subject's Helper is the Working Class and Man's efforts are hindered by the Bourgeoisie:

Subject	.....	Man
Object	.....	Classless society
Sender	.....	History
Receiver	.....	Humanity
Helper	.....	Working class
Opponent	.....	Bourgeoisie

***Table 1**: from (Greimas 1966b[r], 181)*

In line with Palma's reading of Greimas, we can see how the Bourgeoisie becomes "anti-humanity" in Marxist thought. I am quite uncertain how to configure this table when it comes to the IPCC. I would believe that the subject is "the climate", the object could be "sustainability", the sender is "science" and the receiver is "humanity".

Subject	.....	Climate
Object	.....	Sustainability
Sender	.....	Science
Receiver	.....	Humanity
Helper	.....	Knowledge
Opponent	.....	Ignorance

***Table 2**: A Greimasian heuristics for the structure of climate science, based on (Greimas 1966b[r], 181)*

In line with these theoretical insights, I will suggest that through the application of narrative theories, it might be possible to shed more light on the fundamental structures of my materials.

The choice of Greimas as a theoretical foundation for a paper might seem outdated. The structural study of stories and myths had its zenith in the 1960s and the 1970s. The IPCC has the mandate "to provide policy relevant but not policy prescriptive information on key aspects of climate change" (2010[r], 1). This mandate might be interpreted to give open passage to scientism (Wynne 2010[r]), where "scientific evidence is the only authority suitable to justify policy action" (Beck 2012[r], 166). The formulation of the mandate remains close to an ideal of value-free science where the distinction between facts and values – and Science and Politics – is clear-cut (Latour 2015[r]). This form of "strategic positivism", which is the label Bruno Latour (2015[r]) places on the IPCC approach, he sees as failing in convincing the public of its conclusions. In order to shed more light on how the IPCC takes into account the people affected by its proposals, I propose – as a pragmatic and heuristic approach – to use Greimas' actantial model in order "to go looking for invisible entities and appellants" (Latour 2004[r], 162), and to see how the actors "public", "citizen", "stakeholders", and "laypeople" are framed in the IPCC report on mitigation of climate change. The application of Greimas is then a pragmatic choice: I want to see what kind of results it yields – if any – and to use theoretical insights from the studies of the intersection between policy and science to make sense of the outcomes.

The use of Greimas does not imply that I see his theoretical insights as flawless. The form of structuralism Greimas presents builds on a range of collected examples from which he entangled some categories. The relations between these categories are then described as "structures" – hence "structuralism". These relations are subsequently turned into transcendent agents that cause some event in the world. Criticisms also point to the rationalist, mentalist and abstraction-orientated character of structuralism and structuralist readings (Otto & Bubandt 2010[r]). The structuralist interpretative position is further criticized for being random in relation to its object (Derrida 2001[r]) – or for disguising a power position (Foucault 2001[r]).

My approach here should be complemented by thicker studies of views of non-experts and participants from outside of science and/or policy (see e.g. Geertz 1973[r]; Welsh & Wynne 2013[r]); as suggested by Linda Soneryd in her remark that "[i]maginaries that policy-makers use to frame publics can be powerful, but they are also context specific, intrinsically embedded in the history and practice of particular organizations" (2015[r], 20). However, any approach using notions of social imaginaries should be aware of possible conservative or conservatory bias since these approaches might lay a strong emphasis on the past as a source for moral beliefs (van der Burg 2016[r]).

Climate Change and Ethics

IPCC WG III defines mitigation as "a human intervention to reduce the sources or enhance the sinks of greenhouse gases" (2014[r], 4). The Third Working Group has the task to assess highly technical forms of intervention, such as carbon capture and storage or solar radiation management, to more infrastructural or biological considerations related to agriculture and land-use-change, over carbon trading schemes to different types of international agreements and legal instruments. IPCC WG III's Mitigation 2014 writing team consisted of 271 authors, editors, and reviewers (Thorstensen 2015[r]). Since the IPCC does not perform research, but systematizes research findings and relate them to mitigation issues, this article studies the compilations of research results.

Climate change is an ethical issue with several different underlying and interwoven issues as nature and ecosystem conservation, distributive justice and poverty elimination, and social and economic development (Hulme 2009[r]). The solutions to the problems and consequences of climate change are defined as mitigation, but even this choice of words and strategy indicate, according to Stephen Gardiner (2011[r]), an ethical choice since it would be possible – in an analytical sense – to use *prevention, acceptance, avoidance, preparation, coping* and *endurance* of or with climate change. Each of these terms could then be prescriptive for a course of action. The present article investigates all the situations in which "public", "citizen", "stakeholders", and "laypeople" are mentioned in the latest WG III report, and in 2/3 of the mentions they are presented in relation to being barriers or resources to mitigation strategies. Such strategies are targeted to reach a goal, as presented in the following quote:

> The stringent mitigation scenarios discussed in Section 10.10.1 envisage emission intensity reductions, in particular due to

> deployment of CCS. However, public acceptance of widespread diffusion of CCS might hinder the realization of such scenarios. (IPCC 2014[r], 779)

In this randomly selected example an agent ("public acceptance") is set in a relation ("might hinder") to a mitigation goal ("such scenarios of widespread diffusion of CCS"). The report writers see the goal as desirable and as having value in the given context, but there is one important obstacle. This and other cases where non-experts enter into a relation with achieving a desirable state of affairs should be understood as ethical issues since they point towards a society where the right solutions would become part of the forms of life (Hegel 1991[r]).

My object of study is how the IPCC WG III presents the people as helpers or opponents to the process of mitigation. I relate this report to the notion of moral agency, the power to do good things and refrain from doing bad things (Bandura 2002[r], 111). Consequently, those who oppose mitigation are doing bad things and those who promote mitigation are doing good things – and there should also be a neutral zone where people neither oppose nor promote mitigation.

Intension and extension of terms

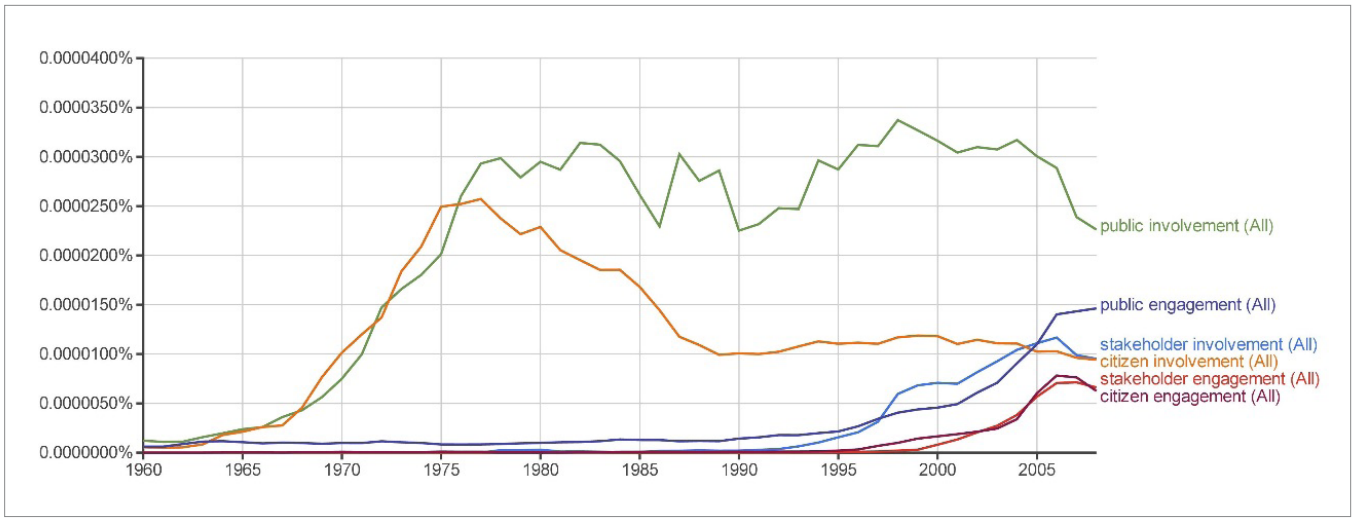
The United Nations Framework Convention on Climate Change (UNFCCC), defines stakeholders under the Clean Development Mechanism as "the public, including individuals, groups or communities affected, or likely to be affected, by the proposed clean development mechanism project activity" (UNFCCC 2005[r], 11; Schneider 2007[r], 51). Such a wide definition suggests that in the case of climate change, the notion of a "stakeholder" must be used to include everyone affected by climate change or mitigation measures. Since climate change is a global phenomenon that will increase in severity in the future, everyone is a stakeholder, the public is global, citizens must encompass even those without voting rights at present, and laypeople are everyone that does not formally decide on the actions against climate change and its consequences. Hence, "public", "citizen", "stakeholders", and "laypeople" are the same in this respect – they share extensionality in the setting of mitigating climate change. Since these textual actors share extensionality, it could reasonably be expected that they fulfill the same functions in the IPCC text as helpers or opponents of mitigation efforts; they should have the same value in their actantial function.

It could have been possible to include other terms, such as "consumer", "politician", "society" and/or "culture". The problem with the term "consumer" is that it relates to the issue of acquiring and using services, goods or ideas – and only this. The framing of people as consumers will then remain limited to "consumerism" (IPCC 2014[r], 304) and behavioural economics (IPCC 2014[r], 252). The inclusion of "politicians" would have yielded very few occurrences, and the four occurrences in Mitigation 2014 are already included in "public". Of course, it is noteworthy that such central actors as the politicians are absent from the text, even though they seem to be alluded to through the adjective and adverb "political(ly)". Analysis of the occurrences of "society" shows that there are many occurrences such as "Because the use of improved and new technologies is an inherent element of society's transformation required for climate change mitigation, technological and societal changes necessarily interact." (IPCC 2014[r], 466) of "the energy audit program by the Energy Conservation Centre of Japan (ECCJ), was found to provide positive net benefits for society" (IPCC 2014[r], 782). These do not add much to the overall picture. The difficulty with including "culture", consists in differentiating between the "culture" that should be preserved in mitigation strategies and the "culture" causing climate change: "research is now available on the importance of behaviour, lifestyles, and culture, and their relationship to over-consumption" (IPCC 2014[r], 290). To include "culture" would have required a different methodology.

It is not customary to treat "public", "citizen", "stakeholders", and "laypeople" as synonymous in other sociotechnical arrangements since stakeholders are often differentiated from other non-experts, when assessing technologies (Forsberg et al. 201[r]). Regarding the identification of stakeholders in climate policy issues, Fenton et al. observe that "the main challenge for coordinators is not identifying who is a stakeholder, but rather determining who is not" (2014[r], 275). Furthermore, when it comes to describing non-experts other than stakeholders, there are different traditions. In the different forms of Technology Assessment, there seems to be an early emphasis on the notion of "citizen" (Schot & Rip 1997[r]), whereas in ethical assessments, one can encounter the notion of "laypeople" (Kaiser et al. 2007[r]). The notion of the "public" is prevalent in larger initiatives, such as the UK "GM Nation?" (Gaskell 2004[r]). Since these terms are the most common ones in different assessment traditions where non-experts are included and since the Fifth Assessment Report is an assessment, I have included these four terms.[1]

"Public", "citizen", "stakeholders", and "laypeople" do not share intension since they cannot be used interchangeably in every context (Kemp 2013[r]), but they could be seen to have more or less the same extensionality, i.e. they refer to the same set of individuals in the setting of climate change. This is the reason why I selected these terms rather than including others.

1 However, the legitimacy of the views from such different "assessment regimes" (Kaiser 2010[r]), vary between political cultures (Nielsen et al. 2007[r]). This variation has been summed up by Sheila Jasanoff in the concept of "civic epistemologies" (Jasanoff 2005[r]).



***Picture 1**: Ngram from books.google.com/ngrams, search conducted 24/04/2016, in the corpus of English books (1960–2008).*

There is a certain development in the use of terms and terminology in the literature, as the Ngram shows. An Ngram shows the occurrence of terms in a corpus of books over time.

The graph shows, not surprisingly, that the usage of the notions of "citizen involvement" and "public involvement" took off in the 1970s, but whereas the "citizen involvement" dwindled "public involvement" stayed on a stable level. "Stakeholders" were to some extent discovered in the 1990s, and the notions of "engagement" gained traction in the late 1990s.

The following argumentation and documentation will try to convince readers that words matter. I will show how the different notions "public", "citizen", "stakeholders", and "laypeople" are in presented in relation to mitigation of climate change as either barriers or resources for mitigation efforts, and there are significant variations. Furthermore, if one agrees with one basic premise, that mitigation efforts are aimed at limiting damages to humans and human society in a wide sense (as in opposition to geology), then it would be expected that notions "public", "citizen", "stakeholders", and "laypeople" should be seen as equals and treated in the same manner also textually.

The current study should be read as simultaneously an input to the discourse internally in the IPCC and as an analysis of the construction of "public", "citizen", "stakeholders", and "laypeople" as agents in mitigation. Following Elizabeth Malone (2009[r], 3), I would state that my interest here is to investigate "how *we talk to each other* about each of these issues and many other issues bound up in climate change" (my italics). I will not suggest that it is possible to draw a clear-cut image of either of these agents, but refer to the polyphonic character of language in climate discourse since climate change reports find themselves in between the political and the scientific (Fløttum 2010[r]). The study takes as a point of departure a view of the IPCC document as a social discourse that both represent and create the world, and that this social discourse represents both social practices and points to social structures (Fairclough 1992[r]).

Material and methods

The textual corpus for this article is the Fifth Assessment Report from Working Group III: Mitigation of Climate Change. Working Group III's task is to "assesses all relevant options for mitigating climate change through limiting or preventing greenhouse gas emissions and enhancing activities that remove them from the atmosphere."[2].

The process from the WG III suggestions via an implemented policy and to successful mitigation depends on a series of factors. Some of these factors can aid mitigation and some hinder mitigation.

Method

Reading and researching the *Mitigation of Climate Change* has constituted the basic method for this research. Since the work commenced before the final report was published, I have relied on the final draft available on http://mitigation2014.org/, while correcting the references with respect to the final print edition (IPCC 2014[r]). The report has been searched for the strings "public", "stakeholder", "citizen" and "laype" in Adobe Acrobat. The findings were listed after each other in an Excel spreadsheet. Through a close reading I deleted the fixed phrases as "public transport", "public

2 http://www.ipcc-wg3.de/

health" and "private-public partnership" since these refer to other phenomenon than "the public". I also deleted findings occurring amongst the references and words like "publication". This resulted in 154 occurrences. Reading the actual sections, I tried to ascertain whether the actual actor was a presented as a barrier or a resource for mitigation, or if the mention was neutral.

The empirical work, numbers

The method described above did not lead to an absolutely clear and concise picture. However, there were interesting patterns that I will present in what follows. The distribution of the mentions is as follows:

	Percentage
Public	57,1 %
Stakeholder	31,2 %
Citizen	10,4 %
Laypeople	1,3 %

***Table 3**: Mentions of public, stakeholders, citizens and laypeople in IPCC 2014 (N=154).*

The occurrences of "laypeople" is so low, that this word will be omitted from much of the later analysis. There is a clear concern in the report with the public and stakeholders, but the occurrences of "citizen" might be too few to draw any conclusions as to the employment of the term.

When it comes to if these four terms are connected to barriers or resources, the next table shows that 40 % of the occurrences are connected to expressing all of these terms as barriers while 25 % see these actors as resources for mitigation.

	Percentage
No mention	34,4 %
Barrier	40,3 %
Resource	25,3 %

Table 4: Public, stakeholders, citizens and laypeople as barriers, resources or no mention to mitigation in IPCC 2014 (N=154).

Examples of what I see to be textual incidences of "No mention", "Barrier" and "Resource" can be exemplified with the quotes below:

"No mention":

> Outside economics, those who study decision sciences emphasize the importance of facing difficult value-based trade-offs across objectives, and the relevance of various techniques to help stakeholders address trade-offs (IPCC 2014[r], 239)

"Barrier":

> the voting public in some countries may have a wait-and-see attitude toward climate change, leading their governments to postpone mitigation measures designed to meet specified climate targets (IPCC 2014[r], 155)

"Resource":

> Musall and Kuik (2011) compared two wind projects, where residents feared negative visual impacts. They found that their fear diminished, and public support for the projects increased when there was co-ownership of the development by the local community. (IPCC 2014[r], 188)

In the first example, stakeholders are mentioned as someone who can be helped in doing a calculation. They can be regarded as one example amongst many that can be assisted in mitigating climate change, but it is the authors who have knowledge of how to involve such assistance. In the case of the barrier example, the authors present an active opposition, while in the resource example, the public is declared to be catalysts for mitigation projects, in this case wind energy.

The distribution, however, differs when the different terms are analyzed separately. Here, the public seems to be presented more frequently as a barrier with 53,4 % of the occurrences of public being in relation to barriers to mitigation efforts and with the lowest frequency for being a resource with 21,6 %.

	No mention	Barrier	Resource	
Public	25,0 %	53,4 %	21,6 %	100 %
Stakeholder	45,8 %	22,9 %	31,3 %	100 %
Citizen	56,3 %	12,5 %	31,3 %	100 %

***Table 5**: Public, stakeholders and citizens as barriers, resources or no mention to mitigation in IPCC 2014 (N=152).*

Stakeholders and citizens are much less frequently presented as barriers and more often presented as resources. The largest difference is the "Neutral" for citizens. I should add here that I have not found any statistical correlations between any of the variables.

When I select only the occurrences of "barriers" in the data from the report, it becomes clear that the majority of barriers in the report, as regards the public, stakeholders or citizens.

	Barriers
Public	75,8 %
Stakeholder	17,7 %
Citizen	3,2 %
Laypeople	3,2 %

***Table 6**: Barriers to mitigation: Public, stakeholders and citizens as barriers to mitigation in IPCC 2014 (N=62).*

Of the 62 mentions of barriers to mitigation efforts amongst unorganized civil society, 75, 8 % of the occurrences relate to the public.

	Resources
Public	48,7 %
Stakeholder	38,5 %
Citizen	12,8 %
Laypeople	

Table 7: Resources for mitigation: Public, stakeholders and citizens as resources mitigation in IPCC 2014 (N=39).

48,7% of the occurrences relate to the public as a resource. Stakeholders have twice as large odds for being presented as resources rather than as barriers to mitigation (table 5) and citizens are four times likely to be seen as a resource than as a barrier.

When it comes to the numbers for neutral mentions, these are close to the values given for "resources" (table 7).

	No mention
Public	41,5 %
Stakeholder	41,5 %
Citizen	17,0 %
Laypeople	

Table 8: Neutral to mitigation: Public, stakeholders and citizens an no mention as role to mitigation in IPCC 2014 (N=53).

It can be argued that the IPCC WG III is divided in three parts: one social, one technical, and one on finance and policy. The Distributions of the occurrences of the actors and their roles in these different parts can provide some further insights into the different disciplines thinking about the public, stakeholders and citizens.

	Social	Technical	Policy & finance	Total report
Public	54,1	69,2	28,6	(57,1)
Stakeholder	29,5	26,9	50,0	(31,2)
Citizen	13,1	3,8	21,4	(10,4)
Laypeople	2,3			(1,3)
No mention	39,3	34,6	32,1	(34,4)
Barrier	39,3	44,2	21,4	(40,3)
Resource	21,3	21,2	46,4	(25,3)

Table 9: The public, stakeholders, citizens and laypeople – as well as as barriers and resources – divided by sections in IPCC 2014

These numbers further suggest that there are differences, but that the differences rather are between the last part on policy and finance, where stakeholders are an important term, and the remaining parts. The impression from these number further calls for an exploration of the presentation of stakeholders.

As is also illustrated in the examples of barriers and resources, there is an overwhelming presentation of the public, stakeholders and citizens as a collective. Only in three instances (1.9%) do the authors reflect on the diversity of the public and other social phenomena that might cause influence on the public, stakeholders or citizens as actors in climate mitigation.

Closer investigation of how the different actors are presented might provide some answers as to how to interpret the seemingly unreflective usage of the terms in the WG III report. A further question is then to see how the notions of stakeholders and the public are presented. These terms are not in any way defined in a meaningful manner, which of course is understandable given the huge task of the IPCC WG III to deliver global policy advice. Nevertheless, given the wickedness of the problem (Lazarus 2009[rf]), clear concepts would be preferable. The question of future generations as stakeholders is treated in Chapter 3 "Social, Economic and Ethical Concepts and Methods", as well as mentioned in other parts of the chapters assessing social issues. However, the question is not included in the other two parts that address technology and industry and policy and finance – even though these last two parts draw heavily upon assessment models based on a cost-benefit structure (Edmonds et al. 2012[rf]).

Discussions

The findings above will now be analyzed according to two different strands. I have chosen here to conduct a deeper study of the largest groups of occurrences in the text: "public" and "stakeholders". First, I will investigate if the IPCC WG III refers to shareholders when they write "stakeholders" (Smith 2003[rf]). Then I will investigate if the "public" are seen as the kind of change-resistant and non-rational entity that Brian Wynne (1991[rf]) has presented in his "deficit model of public understanding of science".

The stakeholders' interests

To reduce the concept of "stakeholders" to those having a financial or business interest in the mitigation measures, could be a possible interpretation of the numbers listed earlier. This is known as the "shareholders vs. stakeholders debate" where a shareholder view of a situation leads to the conclusion that a business has only obligations towards its shareholders, while the stakeholder view claims that a company has wider social obligations (Smith 2003[rf]).

However, upon reading through the passages, it is only in the cases where stakeholders are seen as barriers to mitigation that such an understanding of stakeholders as shareholders seems high, but not even here are stakeholders mainly connected to business.

STAKEHOLDERS	interest or finance	not interest or finance
Barriers	44,4 %	55,6 %
Resource	15,4 %	84,6 %
Neutral	27,8 %	72,2 %
sum	27,5 %	72,5 %

***Table 10**: Presentation of "stakeholders" in relation to finance or business interests – as well as as barriers and resources in IPCC 2014*

In several of the occurrences, NGOs are presented as stakeholders. This, of course, reduces the percentage of stakeholders connected to finance.

The public perception/accept

It is of interest to see if the issue of public acceptance or public perception dominates when it comes to their representations in the text. Wynne (2003[r], 20) writes that "it is now accepted that trust and credibility are major contextual factors influencing the uptake and understanding of scientific messages". To omit issues of trust and credibility while focusing on acceptance and perceptions could indicate a version of the "deficit model of public understanding of science". According to Brian Wynne (1991[r]) such a "deficit model" consists of two features: the naturalness of scientific understanding of the world and the view that the lack of such understanding indicates a deficit of democratic capabilities.

PUBLIC	public perception	public acceptance	not perception / acceptance	Total public perception / acceptance
barriers	26,8 %	43,9 %	29,3 %	70,7 %
resource	35,7 %	42,9 %	21,4 %	78,6 %
neutral	21,1 %	21,1 %	57,9 %	42,1 %
Sum	27,0 %	37,8 %	35,1 %	64,9 %

***Table 11**: Presentation of "the public" in relation to public perception or public accept – as well as barriers and resources in IPCC 2014*

In table 9, the numbers point towards a presentation of the public as being a resource or a barrier depending on their perception or accept of policies seems to be very clear. However, the neutral mentions of the public departs rather markedly from this tendency. Some places in the IPCC report (2014[r], 255 & 319), the report draws on issues of trust, but in general there are indications of a deficit understanding of the public in the chapters of the IPCC WG III report.

Problems with a normative deficit model

Brian Wynne and others' reasoning on a cognitive deficit model has as its core a view from "science" that "the public" do not understand science and this leads to the wrong choices. Currently, another model is gaining ground that explains us how people (in some cases "the public") disagree with the policies proposed to mitigate climate change because these conflict with other preferences (on taxation), which in its turn leads to opposition to the scientific explanation of climate change (Klein 2014[r]). Without any kind of judgment as to the veracity, usefulness or preciseness of this explanatory model, I wish to call it "the normative deficit model of public understanding of science". Here it is the naturalness of a specific political and/or normative position that is given authority, and deviations from this is then used by pundits to explain the consequent cognitive judgement that climate change is either not real or not a very important problem compared to other more pressing issues. This normative deficit model can be phrased in different conditionals: If you deny climate change, then you disagree with government-imposed restrictions; or: If you oppose government-imposed restrictions, then you deny climate change. These two different conditionals also refer to different understandings of the (legitimate) relation between science and politics.— In the first position, it is the stance that science controls what is politically legitimate, and the second position suggests that it is up to politics – or another normative instance – to give science its mandate. Oreskes and Conway (2010[r]) use the latter position in *The Merchants of Doubt*. It might also be given a looser formulation, but then the insight loses some of its saliency: there is a (strong) correlation between denial of climate change and opposition to government-imposed restrictions. Dan Sarewitz (2004[r], 83) can be one example of such a position when he writes, "the politics behind environmentalism was probably more important for furthering the science than the science was for advancing the politics".

Problems with a static and one-dimensional view of the public

The prevalent understanding in the IPCC WG III that the public is a homogenous group that has common perceptions and accept or reject technological solutions might be an unfortunate carrier of sweeping generalizations that might hinder successful mitigation. There are indications to the contrary, namely that the public needs to see the solutions as just or trust the messenger presenting new solutions. Far from claiming that the public has all the solutions to climate change, I will nevertheless just briefly touch upon the issue of giving policy advice based on static views of the public. Primarily, values and interests as well as first and second order preferences might create perceptions of what constitutes a good solution. One example can be seen in Germany where there has been a rejection of one technology proposed by the IPCC WG III, namely carbon capture and storage (CCS) – as well as the more well-known plan to phase out all nuclear power plants. CCS is a technology cluster that might reduce the carbon dioxide emission significantly. The German rejection based on a preference for other technologies than those based on fossil fuels – as well as concerns over the storage of carbon dioxide underground on-shore (Dütschke 2011[r]). It is then reasonable to deduce that the preference of avoiding fossil fuels altogether is stronger than the preference to clean fossil fuels or that the risks of storing carbon were compared to the risks

of storing nuclear waste, and the alternatives of wind and other renewables seemed more preferable – or what Gardiner (2011[r]) would refer to as *prevention* rather than *mitigation* as a strategy for solving the challenges of climate change. Of course, this touches upon acceptance, but not of a general acceptance or rejection of mitigation technologies, but rather an informed judgment on technological pathways – and possibly with a dash of nimby-ism.

The Public – Principled or General?

Mike Michael (2009[r]) advances an analysis where he contrasts the representation of the public in two rhetorical categories: Publics-in-General (PiGs) and Publics-in-Particular (PiPs). A simplified version of Michael's dichotomy could read as that PiPs are the publics that are involved in or have a stake in the technology under development or in some way are affected by its impacts. Useful illustrations can be the involvement of cancer patients in the development of new testing and treatment or engagement with the local population in the planning and building of a new carbon capture and storage facility. PiGs are the generalized total public, the one that is constructed through phrases as "the general public" or "the taxpayers" – and their equivalent. Michael has obviously worked structurally, to some extent like this paper, in establishing the dichotomy since he ends of listing how the PiPs and the PiGs are contrasted through different oppositional pairs, where he lists among others:

- Instrumental (means-oriented)/Substantive (ends-oriented)
- Interested/Disinterested/Uninterested
- Authentic/Inauthentic
- Self-interested/Oriented to broader interests
- Decided/Undecided (Certain/Uncertain)
- Cooperative/Obstreperous
- Democratic/Anti-democratic (Michael 2009[r], 627)

Based on Michael's model, one would expect that the few places that the public are seen as a resource to and for mitigation, they would be presented as PiPs while where they are barriers, they would consequently be presented as PiGs. This hypothesis constitutes reversing Michael's findings in the sense that he worked inductively while the current paper takes his categorization as a basis for a taxonomic endeavor.

Now, there are only 19 instances where the public is seen as a resource, while there are 47 where they are seen as barriers. I will illustrate the findings of PiPs and PiGs and their relation to barriers and resources for mitigation, in the IPCC WG III (2014[r]), in Table 10. It is not unproblematic to move from Michael's thick interpretations to numbers. Take for example the following quote:

> public support for the projects increased when there was co-ownership of the development by the local community [...] Hence, there was greater support of CCS when its promoters were perceived to be acting in the public interest rather than purely for profit. Those opposing CCS were less likely to succeed when they were perceived to be acting to protect their own economic interests, such as property values, rather than focusing on environmental quality and the public good. (IPCC 2014[r], 188)

In the first instance, it is a PiP, but in the second instance "public" is used to indicate a general interest, ergo a PiG. Furthermore, when reading the occurrences of the public as barrier or resource for mitigation, it is only in the cases where the public is presented as a barrier that the report writes "the general public" or equivalent phrases.

	Barriers	Neutral	Resources
PiGs	47	22	18
PiPs	0	0	1

***Table 12**: Presentation of "the public" as PiP or PiG (Michael 2009) according to whether they are represented as barriers for, neutral to or resources for mitigation in IPCC 2014.*

In several places in the WG III Mitigation 2014, the authors write on a general level about the need for local knowledge, engagement, activities and other factors, but they rarely illustrate what this means and how it should be done – that is they never illustrate PiGs as including PiPs. This very abstract and impersonalized form is further strengthened by the complete absence of pictures of real places in WG III Mitigation 2014's 1436 pages, which is a notable change from the two pictures in the Fourth Assessment report's 863 pages (IPCC 2007[r], 270 & 610). Such editorial choices should be further scrutinized when it is well established that climate science is a highly medialized field (Tøsse 2013[r]), which also contributes to its political relevance (Peters et al. 2008[r]). It is further established in the study of how the public engages with science, that they tend to focus on the social contexts (Pigdon et al. 2014[r]). Sheila Jasanoff (2010[r]) sees that the IPCC tends to separate knowledge from meaning.

The following quote might serve as an example on the level of abstractions concerning the public: "RE [renewable energy] and energy-efficiency programmes will continue to face public acceptability problems. Indeed, attitudes towards RE in addition to rationality are driven by emotions and psychological issues" (IPCC 2014[r], 552). However, the analysed IPCC report does not seem to support my hypothesis that one would find Michael's (2009[r]) PiPs as resources and PiGs as barriers. Nevertheless, there is the trend that the authors always refer to barriers when they mention "the general public".

Integrated research projects

The IPCC Working Group III is composed of social scientists, legal scholars, economists, humanists, and political scientists and other academics from the subjects that are part of the umbrella called Ethical, Legal and Social Aspects (Implications) of New Technologies (ELSA) (Nydal et al. 2015[r]). According to the reasoning and the numbers presented in this article, it seems that the researchers from the ELSA field on climate science share the same deficit view

of the public as many natural scientific climate scientists (Tøsse 2013[r]; Thorstensen 2014[r]; Heidenreich 2015[r]).

"Integrated projects" are research projects where researchers from the ELSA field enter into co-operation with natural scientists in order to create reflection, or reflexive practices, during and in the research and development process of new technologies (Forsberg 2014). However, as the analysis in this paper indicates, it might be neither sufficient nor necessary just to include researchers from the ELSA fields into (climate) science if these researchers do not add or create reflection on one of the very basic questions of the scientific endeavor: "how can this research bring the world in the right direction?". Michael (2009[r]) notes how all the different models of publics and science construct them as oppositions.

Contribution of Greimasian analysis

Did the method I applied then contribute to anything that we did not know before – or that have not been put together earlier? Is this method at all suitable for analyzing big corpora of text? That the IPCC WG III uses and repeats the same formulations as are found in all forms of research articles on the relations between science, policy and the public –as well as between facts and values – is hardly surprising. However, the tendency to see "citizens" in a better light than the "public" depended on a bird's-eye view of the text. The method further complements Mike Michael's findings. The weaker elements of this method is that it becomes unclear what kind of public or what kind of stakeholders the text refers to – and what are the contextual factors for the conclusion included by the IPCC WG III.

Conclusions

Through an analysis of some actors as actants in Mitigation 2014, I have aimed at contributing to giving them "flesh and features that make them have some form or shape, no matter how vague" (Latour 2005[r], 53). Where Mike Michael (2009[r]) illustrates how different sets or types of "public" are rhetorically produced in the literature and practice of relating those from outside the science and technology field to those inside these fields, I have shown how barriers to and resources for are rhetorically produced through choices of extensionally equal terms. Of course, there are some differences between the words "citizen", "stakeholder" and "public", but in the setting of the IPCC and the UNFCCC they are synonymous. Outside of this setting, I can only speculate on how a convener of an arrangement would decide upon the choice of words, and how this would affect the selection of participants and the possible impacts.

When defining a term one typically has the choice between an extensional and an intensional definition strategy: The extensional – or denotative – strategy is based on pointing to the elements that together constitute the class denoted by the term. The intensional – or connotative – strategy lists the different qualities indicated by the term. The analysis above suggests that the IPCC WG III report presents "the public" as being more troublesome and a greater obstacle to mitigation than "citizens" and "stakeholders", even though these terms share extensionality in the UNFCCC official documents (UNFCCC 2005[r]). The public is very close to become the anti-Subject in the Greimasian actant model. Through applying Palma's notions of the opponent as anti-Subject, the public becomes anti-Climate. The *figuration* of agency is then founded in a "public" who are to a large extent portrayed in a non-relational way as "perceiving" or "accepting" new solutions and not interacting or producing.

According to Klaus Theweleit (1987[r]), the transforming elite must deploy their energies in overcoming and destroying what they perceive as barriers to the order. In the present theoretical context where the IPCC discourse points to social structures and practices, the use of words and terminology then also tends to show (as opposed to tell) towards the proposed political solutions. Far from suggesting that one can conclude with a vulgar reading of Ferdinand de Saussure, that the sign is arbitrary in the meaning that a word or a phrase could mean anything and that this randomness is similar to talking to Humpty-Dumpty in *Alice in Wonderland*, I will rather underline the essence of a Saussurian reading that the signs are independent from the meaning but that these meanings are created by humans (Saussure 1995[r]). One danger associated with presenting the public as a barrier to the mitigation of climate change while presenting citizens and stakeholders in a more positive light, is that such an image corresponds all too well with important European social stories about the threat from the masses. This understanding of "the crowd" as an element to fear and strive to control can be traced back to Gustave Le Bon (1899[r]) that has had followers in the social sciences throughout the 20th century (McPhail 1991[r]) and used to deride the tastes, values and preferences of the people (Ryan 2012[r]). The re-actualization of a strong cultural stereotype, the crowd, runs the danger of excluding the public, or citizens or stakeholders, from informed and cooperative climate change mitigation.

The ethics of climate change does not need scapegoats. In the analysed IPCC WG III report, the public fares much worse than their extensional equals do. The notions of a public that can be found through simple analysis of yes or no to a technologically founded mitigation option, as opposed to the more rational and responsible citizens and stakeholders, does not take the struggle against anthropogenic climate change any further. Ordinary people will carry the main burdens of future mitigation measures. Therefore, the success or failure of such measures depend to a large degree that they correspond to the values and / or preferences of ordinary people. Texts with policy relevance should reflect this simple fact.

References

Bandura, A. 2002. Selective Moral Disengagement in the Exercise of Moral Agency. Journal of Moral Education, 31(2), 101–119. https://doi.org/10.1080/0305724022014322

Beck, S. 2012. Between Tribalism and Trust: The IPCC Under the" Public Microscope." Nature and Culture, 7(2), 151–173.

Budniakiewicz, T. 1992. Fundamentals of Story Logic: Introduction to Greimassian semiotics. Amsterdam; New York: John Benjamins Publishing Company.

Carroll, L. 1893. Through the looking-glass and what Alice found there. Thomas Y. Crowell Company, Ed..New York; Boston: Thomas Y. Crowell & Co. Retrieved from http://catalog.hathitrust.org/api/volumes/oclc/2495469.html

Derrida, J. 2001. Writing and difference. London: Routledge.

Dütschke, E. 2011. What drives local public acceptance–Comparing two cases from Germany. Energy Procedia, 4, 6234–6240. https://doi.org/10.1016/j.egypro.2011.02.636

Edmonds, D. J. A., Calvin, D. K. V., Clarke, D. L. E., Janetos, D. A. C., Kim, D. S. H., Wise, D. M. A., & McJeon, D. H. C. 2012. Integrated Assessment Modeling integrated assessment modeling (IAM.) In R. A. Meyers (Ed.), Encyclopedia of Sustainability Science and Technology (pp. 5398–5428. Springer New York.

Fairclough, N. 1992. Discourse and social change. Cambridge, UK ; Cambridge, MA: Polity Press.

Fløttum, K. 2010. A linguistic and discursive view on climate change discourse. ASp. La Revue Du GERAS, (58), 19–37. https://doi.org/10.4000/asp.1793

Forsberg, E.-M. 2014. Institutionalising ELSA in the moment of breakdown? Life Sciences, Society and Policy, 10(1), 1. https://doi.org/10.1186/2195-7819-10-1

Forsberg, E.-M., Thorstensen, E., Nielsen, R. Ø., & Bakker, E. de. 2014. Assessments of emerging science and technologies: Mapping the landscape. Science and Public Policy, 41(3), 306–316. https://doi.org/10.1093/scipol/scu025

Foucault, M. 2001. Madness and civilization: a history of insanity in the age of reason. London: Routledge.

Gardiner, S. M. 2011. A perfect moral storm: the ethical tragedy of climate change. New York: Oxford University Press.

Gaskell, G. 2004. Science policy and society: the British debate over GM agriculture. Current Opinion in Biotechnology, 15(3), 241–245.

Geertz, C. 1973. The interpretation of cultures: selected essays. New York: Basic Books.

Greimas, A. J. 1966a. Éléments pour une théorie de l'interprétation du récit mythique. Communications, 8(1), 28–59. https://doi.org/10.3406/comm.1966.1114

Greimas, A. J. 1966b. Sémantique structurale, recherche de méthode,. Paris: Larousse.

Hawkes, T. 2003. Structuralism and semiotics (2. ed., reprinted. London: Routledge.

Hegel, G. W. F. 1991. Elements of the philosophy of right. A. W. Wood, Ed., H. B. Nisbet, Trans.. Cambridge [England]; New York: Cambridge University Press.

Heidenreich, S. 2015. Sublime technology and object of fear: offshore wind scientists assessing publics. Environment and Planning A, 47(5), 1047–1062. https://doi.org/10.1177/0308518X15592311

Hulme, M. 2009. Why We Disagree About Climate Change: Understanding Controversy, Inaction and Opportunity. Cambridge University Press.

IPCC. 2007. Climate change 2007: mitigation of climate change: contribution of Working Group III to the Fourth assessment report of the Intergovernmental Panel on Climate Change [B. Metz, O.R. Davidson, R. Dave, L.A. Meyer (eds)]. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.

IPCC. 2010. Statement on IPCC principles and procedure. Intergovernmental Panel on Climate Change. Retrieved from http://www.ipcc.ch/pdf/press/ipcc-statement-principles-procedures-02-2010.pdf

IPCC. 2014. Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. O. Edenhofer, R. Pichs-Madruga, Y. Sokona, J. C. Minx, E. Farahani, S. Kadner, ... T. Zwickel, Eds.. Cambridge, United Kingdom and New York, NY, USA: Cambridge Univ Press.

Jasanoff, S. 2005. Designs on nature: science and democracy in Europe and the United States. Princeton, N.J.: Princeton University Press.

Jasanoff, S. 2010. A New Climate for Society. Theory, Culture & Society, 27(2-3), 233–253. https://doi.org/10.1177/0263276409361497

Kaiser, M. 2010. Futures Assessed: How Technology Assessment, Ethics and Think Tanks Make Sense of an Unknown Future. In M. Kaiser, M. Kurath, S. Maasen, & C. Rehmann-Sutter (Eds.), Governing Future Technologies (pp. 179–197). Springer Netherlands. Kaiser, M., Millar, K., Thorstensen, E., & Tomkins, S. 2007. Developing the ethical matrix as a decision support framework: GM fish as a case study. Journal of Agricultural and Environmental Ethics, 20(1), 65–80. https://doi.org/10.1007/s10806-006-9023-8

Kemp, G. 2013. What is this thing called philosophy of language? London ; New York: Routledge.

Klein, N. 2014. This Changes Everything: Capitalism vs. The Climate. New York: Simon & Schuster.

Latour, B. 2004. Politics of nature: how to bring the sciences into democracy. Cambridge, Mass: Harvard University Press.

Latour, B. 2005. Reassembling the social: an introduction to actor-network-theory. Oxford ; New York: Oxford University Press.

Latour, B. 2015. Telling Friends from Foes in the Time of the Anthropocene. In C. Hamilton, F. Gemenne, & C. Bonneuil (Eds.), The Anthropocene and the Global Environmental Crisis: Rethinking Modernity in a New Epoch (pp. 145–155.) Oxon: Routledge.

Lazarus, R. 2009. Super Wicked Problems and Climate Change: Restraining the Present to Liberate the Future. Georgetown

Law Faculty Publications and Other Works. Retrieved from http://scholarship.law.georgetown.edu/facpub/159

Le Bon, G. 1899. Psychologie des foules. Paris: Felix Alcan.

Levi-Strauss, C. 1955. The Structural Study of Myth. The Journal of American Folklore, 68(270), 428. https://doi.org/10.2307/536768

Malone, E. L. 2009. Debating climate change: pathways through argument to agreement. London ; Sterling, VA: Earthscan.

McPhail, C. 1991. The Myth of the Madding Crowd. Transaction Publishers.

Michael, M. 2009. Publics performing publics: of PiGs, PiPs and politics. Public Understanding of Science, 18(5), 617–631. https://doi.org/10.1177/0963662508098581

Nielsen, A. P., Lassen, J., & Sandøe, P. 2007. Democracy at its Best? The Consensus Conference in a Cross-national Perspective. Journal of Agricultural and Environmental Ethics, 20(1), 13–35. https://doi.org/10.1007/s10806-006-9018-5

Nydal, R., Myhr, A. I., & Myskja, B. K. 2015. From ethics of restriction to ethics of construction: ELSA research in Norway. Nordic Journal of Science and Technology, 3(1), 34–45.

Oreskes, N., & Conway, E. M. 2010. Merchants of doubt: how a handful of scientists obscured the truth on issues from tobacco smoke to global warming. New York: Bloomsbury Press.

Otto, T., & Bubandt, N. 2010. Beyond Structural Wholes? Introduction to Part 3. In T. Otto & N. Bubandt (Eds.), Experiments in holism: theory and practice in contemporary anthropology (pp. 177–186). Chichester, West Sussex ; Malden, MA: Wiley-Blackwell.

Palma, J. 1990. Le modèle" actantiel", méthode d'analyse du politique (Études et Recherches No. 48. Science politique, Faculté de droit, Université de Liège. Retrieved from http://www.ulg.ac.be/capri/EtudesRecherches/PalmaActantiel.pdf

Pellizzoni, L. 2004. Responsibility and Environmental Governance. Environmental Politics, 13(3), 541–565. https://doi.org/10.1080/0964401042000229034

Peters, H. P., Heinrichs, H., Jung, A., Kallfass, M., & Petersen, I. 2008. Medialization of Science as a Prerequisite of Its Legitimization and Political Relevance. In D. Cheng, M. Claessens, T. Gascoigne, J. Metcalfe, B. Schiele, & S. Shi (Eds.), Communicating Science in Social Contexts (pp. 71–92). Dordrecht: Springer Netherlands. Retrieved from http://link.springer.com/10.1007/978-1-4020-8598-7_5

Pidgeon, N., Demski, C., Butler, C., Parkhill, K., & Spence, A. 2014. Creating a national citizen engagement process for energy policy. Proceedings of the National Academy of Sciences, 111 (Supplement_4), 13606–13613. https://doi.org/10.1073/pnas.1317512111

Propp, V. 1968. Morphology of the folktale, Austin: University of Texas Press.

Propp, V. 1984. Theory and history of folklore. A. Liberman, Ed., Minneapolis: University of Minnesota Press.

Ryan, A. 2012. On Politics. Allen Lane.

Sarewitz, D. 2004. How science makes environmental controversies worse. Environmental Science & Policy, 7(5), 385–403. https://doi.org/10.1016/j.envsci.2004.06.001

Saussure, F. de. 1995. Cours de linguistique générale. Paris: Payot et Rivages.

Schneider, L. 2007. Is the CDM fulfilling its environmental and sustainable development objectives? An evaluation of the CDM and options for improvement (Report prepared for WWF). Berlin: Öko-Institut. Retrieved from http://www.ecodialog.org/oekodoc/622/2007-162-en.pdf

Schot, J., & Rip, A. 1997. The past and future of constructive technology assessment. Technological Forecasting and Social Change, 54(2), 251–268.

Smith, H. J. 2003. The Shareholders vs. Stakeholders Debate. MIT Sloan Management Review, 44(4), 85–90.

Soneryd, L. 2015. What is at stake? Practices of linking actors, issues and scales in environmental politics. Nordic Journal of Science and Technology, 3(2), 18–23.

Theweleit, K. 1987. Male fantasies. Minneapolis: University of Minnesota Press.

Thorstensen, E. 2014. Public Involvement and Narrative Fallacies of Nanotechnologies. NanoEthics, 8(3), 227–240. https://doi.org/10.1007/s11569-014-0202-1

Thorstensen, E. 2015. Patent-holders on expert committees. Can there be a conflict of interest? Etikk i praksis - Nordic Journal of Applied Ethics, 9(1), 55–72.

Tøsse, S. E. 2013. Aiming for Social or Political Robustness? Media Strategies Among Climate Scientists. Science Communication, 35(1), 32–55. https://doi.org/10.1177/1075547012438465

UNFCCC. 2005. Guidelines for Completing CDM-PDD, CDM-NMB And CDM-NMM (No. Version 04). Retrieved from http://cdm.unfccc.int/Reference/Documents/Guidel_Pdd/English/Guidelines_CDMPDD_NMB_NMM.pdf

van der Burg, S. 2016. A Lay Ethics Quest for Technological Futures: About Tradition, Narrative and Decision-Making. NanoEthics, 1–12. https://doi.org/10.1007/s11569-016-0273-2

Welsh, I., & Wynne, B. 2013. Science, Scientism and Imaginaries of Publics in the UK: Passive Objects, Incipient Threats. Science as Culture, 22(4), 540–566. https://doi.org/10.1080/14636778.2013.764072

Wynne, B. 1991. Knowledges in Context. Science, Technology & Human Values, 16(1), 111–21.

Wynne, B. 2003. Seasick on the Third Wave? Subverting the Hegemony of Propositionalism Response to Collins & Evans (2002). Social Studies of Science, 33(3), 401–417. https://doi.org/10.1177/0306312703033005

Wynne, B. 2010. When doubt becomes a weapon. Nature, 466 (7305), 441–442. https://doi.org/10.1038/466441a

NORDIC JOURNAL
of Science and Technology Studies

EXPERIENCING VIRTUAL SOCIAL ENTERPRISE MEDIA ARCHITECTURES

Lene Pettersen

This article addresses knowledge professionals' experiences of being in and using social enterprise media, which is characterized by a social, people-centric, dynamic and non-hierarchical information architecture. Rather than studying the social enterprise media from a typical STS-perspective in terms of 'scripts', 'antiprogram', or as 'configuring design processes based on the user', the paper direct its analytical lens to the users' experiences, practices and routines when they are making sense of the virtual space in social enterprise media. As theoretical framework, unexplored corners of structuration theory where Giddens (1979[r]; 1984[r]) discusses spatiality (place) and temporality (time), where Giddens is inspired by the philosopher Wittgenstein (1972[r]), the micro-sociologist Goffman (1959[r]), and the time-geographer Hägerstrand (1975[r]; 1978[r]) are employed. With this approach, dynamic social processes are included in our studies of technology. Qualitative insights from a comprehensive and longitudinal case study of a multinational organization with entities in Europe, North Africa and the Middle East were used in order to get an in-depth understanding of how people experienced using virtual and social architectural spaces. The findings show that the social architecture and people-centric model in the virtual space in social enterprise media does not provide an intuitive spatial sense, nor does it provide logics that correspond with known and familiar logics or established communication and interaction practices among employees. Key features in social enterprise media (e.g., transparency) collide with how space is constructed in the physical world and with the logics at play in offline conversations and social interactions (e.g. turn-taking in conversations or the opportunity to withdraw from conversations).

Keywords: Social enterprise media, social architecture, social groups, social interaction, structuration theory, time-geography, Wittgenstein.

Author: Lene Pettersen
Consumption Research Norway (SIFO)
Oslo and Akershus University College of Applied Sciences (HiOA)
lene.pettersen@sifo.hioa.no

Introduction

Media and information technologies is a growing research agenda in studies of information communication technology (ICT) and science and technology studies (STS) (Hackett et al. 2007[r]). Although several intellectual bridges between the two disciplines have been set forth, these have not been explicitly articulated in the literature (Boczkowski and Lievrouw 2007[r]). One such bridge concerns the general question on causality; of social and technological agency versus determinism[1]. Boczkowski and Lievrouw (2007[r]) suggest that instead of seeing 'causality' as a dichotomist notion of 'determinism' versus 'contingency', we should characterize technology as socio-material configurations where different elements expel different degrees of determination and contingency (p. 958). In the paper at hand, I pursue this call in a longitudinal in-depth study of employees in a multinational workplace, and how they make sense of virtual spaces in their organization's social enterprise media platform by using unexplored corners of structuration theory (Giddens 1979[r]; 1984[r]). Social enterprise media (e.g. Yammer, Facebook@work, Jive) are inspired by public social media or social networking sites (e.g., Facebook, Twitter, LinkedIn and others) and their design-features and functionalities (Leonardi et al. 2013[r]).

Transparency is seen as a master key in social enterprise media (Tredinnick 2006[r]), where everyone can take part and observe other's communications and interactions (McAfee 2009[r]). The information architecture in social enterprise media turn previous content models upside-down by having an organic – a Web 2.0 'people-centric' - architecture because content and information are structured around individuals. In the physical world, communication and social interaction is closely tied to a physical conversation space. Social interaction and communication practices in social groups are, for example, characterized by turn-taking in conversations, distance to others, reciprocity, overview of conversation partners, trust, and privacy (Goffman 1959[r]; Giddens and Pierson 1998[r]; Fayard and Weeks 2007[r]). The principles in social architectures in social media are related to key characteristics of conversations and social groups (Kietzmann et al. 2011[r]). Yet, the virtual space in the social architecture of social enterprise media collides with the characteristics of social groups and conversational practices in the physical world because of the lack of spatial sense or orientation, the lack of an overview of conversation members and the lack of privacy in the transparent, virtual platform. Rather than approaching the social enterprise media from a typical STS-perspective in terms of 'scripts' (Akrich 1992[r]), 'antiprogram' (Latour 1992[r]), or as 'configuring design processes based on the user' (Woolgar 1990[r]), the paper direct its analytical lens to the users' experiences, practices and routines when they are making sense of the virtual space in social enterprise media.

As theoretical framework unexplored corners of structuration theory where Giddens (1979[r]; 1984[r]) discusses spatiality (place) and temporality (time) are used. In this vein, Giddens is inspired by the philosopher Wittgenstein (1972[r]), the micro-sociologist Goffman (1959[r]), and the time-geographer Hägerstrand (1975[r]; 1978[r]). Actually, Wittgenstein is considered by some (e.g. Collins 2011[r]; Bloor 1973[r]) to be at the very roof of the STS-tradition. According to late Wittgenstein, language is inextricably tied to practice, routines and experiences. Thus, the meaning of a word, what the color 'red' looks like (Wittgenstein 2000[r]), or how computer programs are interpreted by the user, are learnt practices inseparable from the social context in which the user are part of. Wittgenstein's construct 'language-game' stresses that the speaking of a language is inextricably tied to the activity itself (Helle-Valle 2010[r], 198), an activity that is used the way we are taught to use it (Bloor 1973[r], 184) and when "learning language, the child learns things that are never said" (Collins 2011[r], 280). Language, thus, is the glue that bind practices together (Collins 2011[r], 85). With this approach, the user's language, practices and routines play key roles for how users make sense of logics at play in computer systems. This paper uses these thoughts that Giddens (1979[r]; 1984[r]) developed further in structuration theory and adds a fruitful contribution to the STS discipline of scholarly interest. The study also provide important insights to programmers and system designers designing the next versions of social enterprise media. More specifically I ask the following research question in this paper;

> *How do knowledge professionals experience the virtual space in social enterprise media, and how do they interpret the organic logic of social information architecture at play in social enterprise media?*

The research question is answered with insights from a comprehensive longitudinal case study of knowledge professionals employed in a multinational organization, and as already stated, from the framework of unexplored corners of structuration theory (Giddens 1984[r]).

This article is organized as follows. It begins with a brief introduction of the characteristics of the development of the Internet and information architectures. This is followed by a presentation of the theoretical framework used in this study, a method section and then a presentation of findings. The paper ends with a discussion, concluding remarks, limitations of this study, and a call for further research.

1 In many senses, this dichotomy echoes earlier intellectual debates between reception analysis and literary studies or critical media theory where media scholars disagree in whether meanings are structurally embedded in texts for readers to decode, or if the reader creates the text or content meaningfully themselves, giving favor to agency and a social constructivist lens.

Internet and Information Architecture

The early period of the web in the nineties is characterized by a passive or static one-way sender content model, with few opportunities for readers or users to interact with the platform or website. The first version of the web was followed by the second version - Web 2.0 - or the 'Web-as-participation' characterized by two-way interaction (Song 2010[r]), typically exemplified with the introduction of social media where users are content producers. The semantic Web is sometimes used as a synonym for "Web 3.0" with its main characteristic being that different computer systems exchange data between themselves to provide relevant content to the user (e.g. the computer system suggests new friends, contacts, or products to purchase) (Barassi and Treré 2012[r]). Social enterprise media (e.g., Facebook at work, Yammer or Jive) are implemented in many organizations these days as a replacement of traditional intranets where content are organized in static and hierarchical Web 1.0 manners. The opportunity to form and maintain social connections is key in social media (Ellison 2007[r]). As said, transparency is seen as a master key in social enterprise media (Tredinnick 2006[r]), where everyone can take part and observe other's communications and interactions. Thus, social enterprise media aims to facilitate the flow of employees' knowledge among colleagues across departments, entities and countries, yet also across social statuses and hierarchies (McAfee 2009[r]). However, social enterprise media in the workplace do not correspond with institutionalized practices on how knowledge work is organized, measured, and rewarded in practice, and the expected success of these platforms is still pending (Pettersen 2014[r]).

Information architecture is the practice of designing structures in software (Brown 2010[r]) where information is designed or categorized into semi-structured (smaller) environments. The nodes in the information architecture mainly fall into four classes: hierarchical, matrix, organic or sequential (linear) (Garrett 2003[r]). Traditional intranets have hierarchical structures, which provides a spatial-sense of overview of where the user is located within the larger static structure. For example, the folder logic of a PC desktop typically uses a hierarchical model where content is organized into folders (or "houses") and sub-folders (or "rooms"). The virtual space is designed in manners to provide a spatial sense of where the user is located within the virtual structure. Information architecture in social enterprise media, however, is organic and social; it is built on the principle that groups are self-organized rather than having a structure or organization imposed (Schiltz et al. 2007[r]). The virtual architecture is therefore more flat and centered around peoples' dynamic actions, rather than static, spatial belonging (e.g., computer desktop, department membership, etc.). Organic information structures pose challenges for users to find their way back to the same piece of content again (Garrett 2003[r]), decreasing 'findability'—the capacity of an object to be found through search or browsing (Rosenfeld and Morville 2002[r]).

Theoretical Approach

Structuration theory (Giddens 1984[r]) has been extensively employed in ICT studies and should be applicable to any aspect of ICT research (Jones and Karsten 2008[r]). However, few scholars have used Giddens's theorizing on temporality (time) and spatiality (place) in their work. One exception is Nandhakumar (2002[r]) and his study of virtual workers. In his structuration theory, Giddens (1984[r]) builds on ideas and theories from of number of philosophers and scholars. When theorizing on spatiality and temporality, he is especially inspired by the time-geographer Hägerstrand (1975[r]; 1978[r]), the philosophy of the late Wittgenstein (1972[r]) and his language-game, and the micro-sociologist Goffman (1959[r]), amongst others.

Spatiality and Temporality

According to structuration theory, all social interaction is situated in (tied to) time and place. To Giddens (1984[r]), the idea of 'place' as ordinarily used by geographers overlooks the time-construct by simply designating a point in time as a succession of 'nows'. Giddens refer to the time-geographer Hägerstrand (1975[r]; 1978[r]) who studied everyday social practices when he is theorizing on 'place'. Because time is continuously going on, there will always be movement in time. Yet, logically, movement in time is not tied to place (one can sit still in the same place for hours, but the time will always go on), and with movement in place follows movement in time. In time-geography, the individual's space for action is constrained by his or her path or trajectory, and movements in the future are limited by what are represented within a prism (the opportunities at hand) (Lenntorp 2004[r]). Giddens (1984[r], 117), however, stresses that with all constraints come opportunities. Giddens (1984[r]) introduced the concepts 'locales' and 'presence availability' to describe the inextricable relationship of time and place more fully. 'Locales' denotes that individuals' mobility and communication are inextricably related to the physical properties of their surrounding world. A bus stop, for example, provides a space for bus riders to come together and wait for the bus. Similarly, rooms in a house need doors in order to enter, and two streets are needed in order to form a corner to meet others on (Giddens 1984[r]). Who else is waiting for the bus at the bus stop depends on the specific time you are present at the bus stop. Those who have just jumped on the previous bus are logically no longer present in the bus stop space. They are somewhere else in place. This means that the mutuality of presence and absence needs to be understood in terms of spatiality (place) as well as temporality (time). Both spatiality and temporality provides opportunities for

action. In a house, for example, the organization of rooms provides settings for interaction. A room with no doors provides no opportunity to leave or enter because, as Giddens puts it, 'you can't just walk straight through a wall' (Giddens and Pierson 1998[r]), a metaphor Latour uses in the same manner (Johnson 1988[r], 298).

A similar concept to 'locales' is 'pocket of local order', which denote that human activity requires a certain order or arrangement (Lenntorp 2004[r]). In our everyday lives we move through a number of pockets of local order in which we have varying control of. Pockets of local order are created by the connection of various resources, people, material and so forth, in a particular time-space segment (Lenntorp 2004[r]). Also, trajectories are unambiguous in historical time, but from the present stretching into the future they can, at least in theory, branch off in any number of directions (Lenntorp 2004[r]). However, the constraints on a trajectory always convey limitations. A pre-supposed speed of movement creates a possible time-space that, if a future point in time-space is also specified, forms a so-called prism. A certain constellation of restrictions will decide a prism's configuration (Lenntorp 2004[r]). The concepts of path and prism have contributed to shift the focus from movement per se, and towards an individual's continuous sequencing of stationary activities and movements. Thus, possible movements and opportunities for various activities or actions is closely related to place, opening hours, systems of regulation etc. Giddens (1984[r]) uses the construct 'time-space' to stress the notion that 'space' is inextricably tied to 'time'. Being at the same place at the same time represent opportunities to accidently meet and bump into others. Certain places are particularly important 'stopping places' in that they *invite* to such accidental meetings. As examples in the workplace are the water cooler, the copier or the coffee machine (Fayard and Weeks 2007[r]). Accidental meetings with other employees by the coffee or copy machine are shown to open up conversations that lead from small social talk to work talk that benefits the organization (Fayard and Weeks 2007[r]). These stopping spaces are found to have certain characteristics or affordances; they need to provide spontaneity (it must be a space that people naturally pass by), privacy (people must control the boundaries of their conversations) and legitimacy (the space must offer a reason for people to approach it) (Fayard and Weeks 2007[r]).

Context and Representation

Spaces that provide legitimacy, spontaneity and privacy hold characteristics that provide settings for meaningful and informal interaction. These characteristics, as will be shown below, are also valid also for social interaction in virtual spaces. For example, a trend in the social media landscape today is to provide much smaller interaction spaces (e.g., Snapchat, direct messages among a few participants in Instagram, or conversation thread messages in Facebook). Research into social media sites found that having different circles of friends present in the same space was experienced by users as problematic and induced a context collapse that resulted in users resigning from participation (Brandtzæg, Lüders, and Skjetne 2010[r]). In organizations, the employees are not only likely to have different circles of colleagues, but individuals also hold different hierarchical ranks and social statuses. Pettersen (2016[r]) find that offline, local practices are expanded in the organization's social enterprise media. Similarly, in their study of instant messaging (IM), Quan-Haase and Wellman (2006[r]) find that IM does not remove hierarchical structures. On the contrary, they find that a person's status within the hierarchy of the organization plays a key role in how messages are replied to.

This suggest that virtual spaces needs to be constructed in ways that enable opportunities for action, communication and social interaction that uses the same communication logic that characterizes the practices in social groups. Social interaction is manifested through language and communication (Gumperz and Cook 2008[r]), and social interaction is inextricably tied to the context in which it takes place (Giddens 1984[r]). Because social interaction is situated in time and place, response cues are normative; how to respond in conversations or social interactions depends on the rules of the specific context. In this vein, Giddens is inspired by the thinking of the late Wittgenstein (1972[r]). According to Wittgenstein, language is always tied to social practice and thus to the daily routines that socially integrate individuals. For example, when a mother points to a green apple and says 'green' to her young child, the child knows that 'green' is not another word for 'apple' but rather denotes the color of that particular apple. This is because the child have previously learned what an apple is, and "in learning language, the child learns things that are never said" (Collins 2011[r], 280). In the Internet space, the icon of 'home' -⌂-, only denote a specific website's first page to those who have learnt this previously. This approach is different from many STS-scholars (e.g. Woolgar 1990[r]; Akrich 1992[r]; Latour 1992[r]) that would typically approach the reading of the icon ⌂ in semiotic terms as negotiations with the design feature or between 'programs' and 'antiprograms'. Language-games concern the action that is woven into language, which, in Wittgenstein's thinking, is connected by a family resemblance. Without a learned experience of 'apple', the child would not know that the construct 'green' denote the color and not the object itself. 'Language-game' stresses that the speaking of a language is inextricably tied to the activity itself (Helle-Valle 2010[r], 198), an activity that is used the way we are taught to use it (Bloor 1973[r], 184). Thus, with this theoretical approach to technology, attention is directed towards dynamic social processes. This means that social enterprise media is not restricted to being modelled on representations of work and designed in ways that represent the user's working processes, as are other information system technologies used for working purposes and in working contexts (Orr 1996[r]; Suchman 1995[r]). Social enterprise media also represent a virtual space that needs to nurture the users' social situations and social interaction practices. Yet, the rules for social interactions are learned practices (Wittgenstein 1972[r]; Giddens 1984[r]; Goffman 1959[r]) without universal meaning, as for example, sirens on emergency vehicles or the travelling process at airports with its universal practices such

as check-in, security control, transit, boarding etc. However, the micro-sociologist Goffman (1959[r]) observed that some interaction practices are shared among people. Giddens is inspired by this work of Goffman when he is theorizing about 'time' and 'place', and he uses the concept of 'co-presence' (being together, here and now) to stress the interdependency of the close connection between 'time' and 'place' (Giddens 1984[r]). When physically present with others, there is the opportunity to signal to the others when one chooses to withdraw from a conversation (looking away, turning your body from the others etc.). These are signs that are difficult to recreate with technology, although the design element of a green dot aims to signal when a user is logged on, or when moving dots represent that someone is responding in a conversation in real time, are examples of such efforts.

According to Giddens (1984[r]), face-work (social facial cues) is fundamental to social integration in time-space. When people stand far from each other, they have to shout, and conversation partners miss out on important facial expressions. 'Enclosure' refers to a group that withdraws when conversation partners talk privately in front of others. 'Unfocused attention' is when individuals are aware that others are present and listening, even those standing behind them, leaving diffuse social cues with which to navigate interactions. Co-presence points to the importance of face-to-face interactions for meaningful conversations in which turn-taking occurs and social interactions that take place through everyday language. Giddens (1984[r]) stresses that the number of people which whom one can engage in face-to-face encounters is strictly limited. Dunbar and Dunbar (1998[r]) found that humans can comfortably maintain only 150 stable relationships. However, Brandtzæg, Lüders, and Skjetne (2010[r]) find that having different circles of friends at Facebook induced a context collapse. This suggest that the kind of relationship plays a key role, rather than the number of relationships, for creating co-presence or meaningful engagement.

Face-to-face interactions and co-presence are key to the development of personal trust. Personal trust is the fabric of social activity and depends upon certain specific connections between individuals and their day-to-day social contexts (Giddens 1984[r]). Zheng et al. (2002[r]) tested the correlation between different features in communication media and the development of social trust. Their results clearly show that people who text-chatted benefitted from various kinds of prior activity that focused on social/personal information. Seeing the partner (even a still photo) was very effective by itself, independent of whether or not personal information was disclosed (Zheng et al. 2002[r]). Trust was found to be highest when people had met first, but engaging in a text chat beforehand about social things was nearly as good at establishing trust. Having a photograph was almost as strong as the social chat or meeting in person. The personal dimension in the development of trust and social relationships is clearly important. Establishment of 'trust without touch' stands in opposition to Giddens's view of the importance of co-presence to create trusting relationships. However, Giddens do acknowledge that co-presence is also possible to achieve with electronic communication, such as when people talk together via the telephone (Giddens 1984[r]). This is due to reciprocity, which is key in integration processes, which have the ability to travel across time-space among those who are physically absent in time or space. Thus, relations that already have taken shape in a particular context can exist 'out of time and place', independent of the context in which they were once created. Giddens labels this process 'structuration'. For example, when meeting your manager in the grocery store, the same norms and codes of conduct that are at play in the workplace apply at the grocery store. Thus, once social relationships are established, they have the opportunity to be expanded across time and place (Pettersen 2016[r]).

If conversation logics are valid regardless physical places, the virtual spaces also needs to share some key characteristics that fit these conversation logics. However, as said, organic information architectures pose challenges for users to find their way back to the same piece of content again (Garrett 2003[r]), decreasing 'findability'—the capacity of an object to be found through search or browsing (Rosenfeld and Morville 2002[r]). The virtual spaces should need to be constructed to nurture legitimacy, spontaneity, and privacy (Fayard and Weeks 2007[r]), and to meet the communication logics observed by Goffman (1959[r]). Yet, social architectures do not provide the overview of others, which is needed for privacy. On the contrary, transparency (i.e., they are fully open so everyone can observe everyone else's participation) is seen as a master key in social enterprise media (Tredinnick 2006[r]), where everyone can take part and observe other's communications and interactions (McAfee 2009[r]). This collides with Goffmans' (1959[r]) observations and with the characteristics of spaces that enable people to meet as described by Fayard and Weeks (2007[r]), and needs further exploration.

The Case Study

The case used in this study is a knowledge-intensive organization with approximately 5,000 consultants and offices across Europe, the Middle East and North Africa. In this study, the company is anonymized as Tech Business Company (TBC). TBC operates where ICT and business intersect and offers services spanning consultancy and technology with a shared service portfolio, and social enterprise media would enable consultants working on similar projects yet at different offices, to benefit from each other's work. The sample in this study is composed of consultants who provide the daily services that TBC offers.

Social Enterprise Media

TBC introduced social enterprise media (Jive Business Software version 4.5.2) globally in 2010 – 2011 as a replacement for local

intranets and other local initiatives (e.g., Yammer) in order to increase internal collaboration and knowledge sharing processes, amongst other goals. In Jive Business Software the user can personalize and choose what information blocks or elements the employee wants on his or her own front page. The information structure in the opening pages of the social enterprise media is personalized according to the specific platform-user and consists of a variety of: polls; overviews of projects; current popular documents; colleagues asking for help; the groups the person is member of; activities-feeds from individuals the person follows; announcements and information concerning what is new in the platform; recent documents uploaded on the platform; and so forth. Algorithms are, as in social media, major keys in social enterprise media. The automation of individuals and content with shared or similar characteristics and the users' previous actions are embedded in the enterprise platforms model.

Methodological Approach

Because the overall goal was an in-depth understanding of the virtual space in social enterprise media and employees' understanding of it, a qualitative approach was chosen. Understanding employees' experiences requires research methods that access 'situatedness'—those that draw on observation, with whatever degree of participation, in generating data (Yanow 2006[r]). Such interpretive methods call for fine-grained observational, conversational and/or documentary detail (Yanow 2006[r]). The aim of this study is analytical, rather than statistical generalization, a distinction suggested by Yin (2012[r]). All case studies are analytical constructions, and generalization of data is a question about theoretical and analytical logic, rather than volume.

A pilot study was conducted in 2010 at one of the offices (in Norway) before the social enterprise media was launched. Key informant methodology was used as a tool for obtaining information over time from individuals who knew the community well (Pelto and Pelto 1978[r]).

One three-week ethnographic field study was conducted in May/June 2011 in one office in Norway, and a three-week field study was conducted in two offices in Morocco in July 2011. Participatory observations were done one day in London, three days in Copenhagen and one and a half days at the second office in Oslo, Norway. These observations took place between and after the field studies in 2011. The field studies in Norway and Morocco were repeated one year later to see if there had been any changes in employees' platform use or understanding over time, with three weeks of new field studies in each location.

27 open-ended, in-depth interviews with knowledge professionals from six offices in the UK, Denmark, Norway and Morocco were conducted in 2011. Eight of the participants (from two offices in Norway and two in Morocco) were interviewed again in 2012 to see if they had changed their opinions or use with time. During the field studies, the researcher worked with in the office space with the other TBC employees. Coffee and lunch breaks were particularly important for informal conversations and for getting TBC professionals to share their insights and thoughts. Several informal meetings and talks with consultants, managers and middle managers were done during the workday. These informal conversations were not recorded but are notes in the field diary.

The entire platform (all the entities in TBC's 20+ countries) was thoroughly analyzed in regard to its technical features (information architecture, interaction design, search, information model, etc.), to the platform's content and employees online conversations in regular time lapses from 2010 to 2013. Two features were studied in-depth; the following functionality and the group functionality. Due to having a password and log-in details to the social enterprise media, the platform was studied closely over three years (2010 – 2013). However, the rich ethnographic data and the longitudinal perspective is only partly employed in this paper due to page limitations. The follow-up study in 2012, find that six of the eight interviewees used the social enterprise media less than they did in 2011. Two used it more, mainly as a closed work space. Due to this, the data used to address the research question is mainly from 2011.

To make sure low digital competence was not related to how employees experienced the social enterprise media, the 27 participants filled out a self-report form at the beginning of the interview. Twenty-two of the 27 participants scored 'very high' on digital competence, two scored 'high,' and three scored 'low.' This suggest that the findings is not related to low digital competence (lack of insights on how to use social enterprise media).

Findings

Becoming a Platform Member

When creating a network membership on social media sites (e.g., Facebook, Yammer, or LinkedIn), the user is guided through an introductory process which share some characteristics (Figure 1). First, the user agrees with the privacy consent to enable the membership. When this first step is completed, the service provides the next important steps into the virtual site by suggesting relevant groups the user might want to look at or join, and potential relevant site members or colleagues to follow or add as contacts. After this process, which is illustrated in Figure 1, the software asks

for additional information so it may provide relevant content (e.g., list department, entity, other colleagues' email addresses etc.) when the user has entered the virtual space:

***Figure 1**: Becoming a platform member. Becoming-a-member-process at Yammer, where adding your photo is the last step before the user enters the virtual space.*

When the virtual space process is complete, the site provides content that aims to spark interest and get the user started. Duyne, Landay, and Hong (2002[r]) stress the importance of designing entries in virtual spaces as a process funnel, which consists of several steps based on the user's logics, similar to Giddens' (1984[r]) theorizing on spatiality, stating that a room without doors provides no opportunities to leave or enter. Hence, virtual spaces also need to be constructed in ways that enables opportunities for action. The routines for platform membership in TBC, however, are via the IT department in the parent company located elsewhere. The IT department creates the TBC professional's user-profile and sends the login and password information to the employee via email. TBC-employees therefore never enter the social enterprise media via the important entry. Because the information model in social software is centered on people and dynamics from the users (what they share, 'Liked', who they are connected with etc.) and other individuals, the first steps into the social enterprise media platform are vital for getting a spatial sense and an idea of content and people available.

Making Sense of the Social Enterprise Media Space

The analysis reveals that the social enterprise media is experienced as difficult to navigate and search, as proposed by Rosenfeld and Morville (2002[r]), and Garrett (2003[r]). There are limited information structures that can assist the platform user in creating a spatial overview of the virtual social enterprise media space. One of the Danish consultants explains why he experiences the platform as difficult for finding information:

> The social enterprise media is, in principle, only a bunch of self-organized information containers because there isn't any hierarchy. You can only get hierarchy in groups, so you can't see how things are related. Anyone can sit down and create a group, but the problem is that nobody finds their way back to it. The problem with the social enterprise media is that it has a black hole syndrome; one can put a lot of things in, but unfortunately, it doesn't come out again.

A number of employees have commented that it is difficult to get a spatial overview of the virtual space. The employees typically approach the social enterprise media with reference to the logic of media platforms they know, interpreting the unknown and unfamiliar with past platform experiences, as this Norwegian consultant illustrates

> I think it's difficult to find your way [in the social enterprise media]. If I want to find out who belongs to TBC-Norway, where do I start, what do I search for? A bit like how do I find that list with a picture, name, and a telephone number, like in the traditional intranet? Sorted on departments, with the entities in Norway presented as 'Here is Oslo 1, here is Oslo 2, here is [the third entity in Norway]'. Or sorted on disciplinary belonging, if we had the same groupings in the three places, then we could find everyone working within a given topic.

Hence, the employee has imagined how content should be structured in the virtual space. The consultant continues: 'in my head, content should be organized to look for such and such, but it might be that others placed it in another space they think it belongs, and then I will not find it.' This illustrates Wittgenstein's (1972[r]), language-game, which shows how practices are routinized by repetition in everyday life. Language-games concern language and the actions into which it is woven and connected by family resemblance. Similarly, the consultant above does not make much sense of how information is organized in the social enterprise media space, and she compares it with past experiences. The new way of organizing content does not provide a family resemblance to that with which she is familiar. This illustrates Jarzabkowski and Pinch's (2013[r], 11) argument that constructs as 'script' or 'antiprogram' is less helpful for complex social situations. The consultant does not point to issues related to functionality, but to structure: how content is organized or structured in the virtual space. Using past experiences when encountering new services or logics is also observed when the employees compare the social enterprise media with other similar online services they already know, but their expectations collides with their experience of TBC's social enterprise media. With Wittgenstein's (1972[r]; 2000[r]) lens: the virtual space is encountered with expectations from previous, learnt experiences. One consultant from the UK explains:

> The social enterprise media was described to me as an internal social networking site. So, automatically, I'm thinking of the two major ones in my life: LinkedIn and Facebook. Which I think there's two extremely similar profiles with those two tools, separated by, you know, social and professional. I was expecting an internal LinkedIn.

New technologies are compared with previous patterns of practice and interpretation. Yet social enterprise media also differs from platforms such as LinkedIn and Facebook due to being used in a different context (the workplace) and as a tool closely related to the relevance of peoples work (Pettersen 2014[r]).

The virtual social enterprise media space is referred to as 'a strange world' by many consultants, suggesting that its way of organizing

information and content is foreign to the employees. When information architecture is experienced as having poor navigation and overview, search functionality becomes critical. A number of employees explained that the search functionality does not provide relevant content and that they struggle to find information. One consultant from Norway explained:

> That search is not working. It is so bad, things that are not relevant at all come up. I searched for something really foolish because I have created a fun and informal group. And then up came similar things [auto suggestions] on the page where someone's strategy came up, and I was thinking, 'No, this is not relevant you see, because here we are talking about jokes and fun stuff'.

Thus, the search functionality needs to be robust and linguistic smart (i.e., understand misspellings, similar words, etc.), which is not the case with TBC's social enterprise media. Tagging content with meaningful labels is important for helping search results. However, employees primarily use their native language when communicating and interacting in the social enterprise media. A dilemma, then, is not only how to make sure employees tag their content but also to get them to agree to what language they tag their content with in the virtual space, as well as determine the constructs that best represent the content. This is problematic because choosing which labels to represent and denote any given content does not follow a universal rule, as language is always tied to social practice (Giddens 1984[f]; Wittgenstein 1972[f]). TBC employees speak plenty of different languages and have different opinions about which words best represent and classify their content.

The Virtual Space is Constructed on Characteristics in the Physical World

The analysis of the social enterprise media platform finds that, despite its unstructured and social architecture, all the entities in TBC have constructed their own local semi-spaces in the social enterprise media (Pettersen 2016[f]). These virtual spaces mimic how TBC entities are organized (e.g., sorted by geographical place, departments, topics and teams). These local semi-spaces greet the user with welcome pages and information about their specific unit (who they are, their areas of expertise, location, etc.), often with pictures of the unit, mimicking the reception areas in the entity's office buildings in the physical world. These welcome spaces signal to users where they have entered in the virtual space, similar to the boundaries that are set up in locales between regions by physical or symbolic markers, such as emblems or entry signs (Giddens 1984[f]). In a way, these virtual spaces provide the opportunity to be together in a shared space or as a 'stopping space'. Conversations in these local social enterprise media spaces are mainly carried out in the mother tongue that is spoken in the offline TBC context, and a variety of languages are therefore spoken in TBC's social enterprise media. Hence, the virtual space is constructed as copies of both physical architecture and employees' language practices in their everyday settings.

Not Knowing the Social Enterprise Media Space

Groups in the social enterprise media require insights of the group's existence beforehand. This is also the case with the following functionality. One of the consultants explains that he does not use the social networking functionality because he finds it difficult to "know who likes what" that would be relevant to follow: "It's very difficult to know what people do. Why should I follow these people? If you had a better understanding of who these people are, then you'd have a better understanding of who you want to follow."

The consultant puts his finger on one important matter: It is difficult to know who to follow, who likes what, and which groups to join when such information is not provided by the software (as for example auto suggestions). A consultant in his twenties from Morocco explains that the social enterprise media does not spark his interest in paying it a visit:

> Consultant: The social enterprise media doesn't help me to be interested in it. Interviewer: How can the platform make you interested? What are the tricks? Consultant: Normally the updates. I'm looking for international experience and opportunities.

The consultant illustrates what role 'relevance' plays for using the enterprise media. Another technical limitation is related to the networking functionality. Another consultant, also from Morocco, explains;

> The networking part of the social enterprise media is pretty weak. You can follow people, but then it doesn't really show you the feed of what he's doing. It has never really shown me anything, because I did follow a couple of people who are working on subjects which I find interesting because of a project, but it didn't bring anything valuable.

Again, relevance plays a key role. And what counts as 'relevant' both differs from employee to employee, and changes with time because work is an ongoing process. Several have commented that the networking functionality does not give insights of what people are working on, as they know from the updates at the front page in LinkedIn or the news wall in Facebook, only actions made on static documents. For example, each time someone the user follows modifies a document, it is listed in the newsfeed. Many of the participants explain that they easily miss updates from others due to usability issues with the following functionality. Moreover, in order to receive updates from others, it logically implies that you follow these others.

Knowing the Group Members

Many participants explained that asking questions out in the open in a transparent virtual social enterprise media with no specific receiver or audience is unpleasant. Giddens (1984[f]) terms this as 'unfocused attention'—the awareness that others are present and

listening, as when someone is standing behind you. This leaves diffuse social cues for conversation partners. However, smaller, semi-private virtual spaces provides a more trustful space because of a better overview of group members who are watching or participating in online conversations. To speak publicly online in front of everyone in TBC's enterprise platform is found to differ from speaking to a smaller group of people one knows. How one communicates in groups in the social enterprise media in a working context depends on the audience, as explained by a consultant in his 40s from Norway:

> It depends on the group. We have a closed group for us here at the office, and we have a group for those working with [given topic] in Europe. They are very different settings. The office group has a funny name, and it is something totally different when I'm going to speak with people I sort of do not know at all. One puts on a seriousness filter in some of the virtual spaces.

Hence, what the group members share and how they communicate is closely related to whether, and in what degree, they know the other group members. This suggest that the kind of social relationship plays a key role, rather than the number of relationships present in the same virtual space, for creating co-presence or meaningful social interaction.

In addition, the group's context (e.g., formal or informal) affects what tone one uses in that group. This follows Giddens's further development of Goffman's (1959[r]) theorizing. Face-to-face interactions and co-presence are keys to the development of personal trust (Giddens 1984[r]). Trusting and personally knowing other communication partners are closely related and seem to play important roles in communication practices in the online enterprise space, as this consultant from Morocco explains:

> Most of the discussions are in a professional tone. You do not know the other person. You have not collaborated in some projects, so you cannot be very personal with the person, so you try to avoid misunderstandings.

This corresponds with Quan-Haase and Wellman (2006[r]), which find that a person's status within the hierarchy of the organization plays a key role in how messages are replied to. Some TBC-employees prefer moving their conversation from a public to a private channel for privacy from others who might be watching. Groups are smaller semi-spaces in the enterprise platform that might support a more in-group feeling because they provide virtual spaces that give a better overview of group members than the transparent social enterprise media. In virtual groups, members are listed so the user can see who the other group members are. In smaller groups offline, it is possible to relate to others, interpret social cues provided by the others and control the boundaries of the conversation (Fayard and Weeks 2007[r]; Goffman 1959[r]). The analysis of the social enterprise media and the interviews reveals that most groups are closed, and in order to enter, employees need to apply for group membership as a way to get an overview of who has access to the virtual group-space. The statistics find that on a global scale, the number of groups in the social enterprise media has more than tripled in two years, from 500 in 2011 to 1640 groups in 2013. This increase can be explained in terms of usability issues (due to poor findability of previous groups people create new groups), privacy, and work related issues (teams create a virtual space in the social enterprise media for working purposes). Also, some virtual groups ends being relevant (e.g. when a project is finished), yet not all are deleted although the members are no longer active users.

Not Knowing Strangers

When strangers enter a group that was originally created for a specific local purpose (e.g., a team working on a project), a new situation is created for the group members to interpret. A consultant describes and shows a group she has created in the enterprise platform:

> I have created a group so we can have a place to have documents. And here should everyone in the team be… [The participant pauses and studies closely the group members.] Well, there are more members here than the team. Him, for example, I have no idea of who he is or where he is from. [The consultant clicks on him and reads out loud his name] from [work topic name]. I have no idea of who this is. Here it says he is from [another entity]. Oh dear, how exiting. But I created it originally because I thought it should be our collaborative space.

The information structure and architecture of the social enterprise media makes it possible to join groups regardless of entity membership. When those who are not part of an offline social working group enter the virtual group space, it presents employees with an unfamiliar situation.

An interesting finding is that social (informal) content seems to engage employees by making them feel they are getting to know others personally. One consultant explains why she enjoys reading updates shared by the Danes:

> When I enter the Danes' enterprise space, I feel, 'Wow, they update all the time. Now they have got new videos for rent. The last news about this and that person has been ill, now she's much better,' those kinds of things. Look: [she shows the platform] 'Birthdays in May, [name] is leaving the entity and seeks new opportunities at [another company], someone new started, competence development opportunities.' With these updates, I feel that I know a little more about what the Danes do.

Through social and informal everyday information, the employee feels that she gets to know her Danish colleagues, even though she has not met these individuals about whom she is reading about in person. Keeping an eye on social elements or how things are

while not being at the main office also plays for some consultants a nurturing role for social belonging. For example, one employee in his forties from Norway, explains that he uses the social enterprise media differently in 2012 than he did in 2011. In 2011, he was not in a project and worked from the main TBC-office:

> I use the social enterprise media as a cigarette break. I log on to the platform now and then to get social updates about the local community in Norway. I use the platform less than a year ago, and I use it less for work matters and more of social reasons. I prioritize my time to my work project, and I check out the social stuff in the enterprise platform, like the group that arranged the summer party.

With social updates, the consultant gets a sense of life at his TBC entity. These observations correspond with the findings of Zheng et al. (2002[r]). Personal elements seem to nurture a sense of knowing others. Access to updates from other offices provides a kind of virtual 'stopping place' where it is possible to meet and get to know others. However, this is a peephole – a one-way meeting -, different from, for example, meeting others at the coffee machine or the bus stop. Getting to know others in physical settings is characterized by a balanced reciprocity in sharing personal insights and taking turns between conversation partners. As stated previously, reciprocity is key to both social (face-to-face) and mechanical (across time-space) integration (Giddens 1984).

Lastly, the transparent social enterprise media introduces several paradoxes. Employees' activity becomes visible to others, which simultaneously strengthen established and create new prejudices about others (for example active versus passive platform users), yet it also seems to shorten social distances (e.g., getting a feeling of life in-house while being at clients or a sense of personally knowing others in other entities).

Discussion and Concluding Remarks

The research question asked in this paper, '*How do knowledge professionals experience the virtual space in social enterprise media, and how do they interpret the organic logic of social information architecture at play in social enterprise media?*', was approached by unexplored corners of structuration theory where Giddens (1979[r]; 1984[r]) discusses spatiality (place) and temporality (time). In this theorizing, Giddens is inspired by the philosopher Wittgenstein (1972[r]), the micro-sociologist Goffman (1959[r]), and the time-geographer Hägerstrand (1975[r]; 1978[r]). Approaching the unit of analysis with this theoretical lens, a somewhat different window than many STS-perspectives (e.g. Akrich 1992[r]; Latour 1992[r]; Woolgar 1990[r]) is opened. This enabled me to show that users' experiences, practices and routines play key roles when they are making sense of and using social enterprise media. Although some STS-scholars (e.g. Collins 2011[r]) uses the perspective of late Wittgenstein, this paper illustrates how this literature offers a fruitful approach when studying technology. With this approach, dynamic social processes are included in our analysis, rather than studying functionality alone.

Understanding logics or systems, as well as the speaking of a language, is inextricably tied to the activity itself (Bloor 1973[r]; Helle-Valle 2010[r]), an activity that is used the way we are taught to use it (Bloor 1973[r], 184), just as mathematics and logics are collections of norms (Bloor 1973[r], 189). Thus, new user logics should be modelled both on characteristics that the users already are familiar with, and on logics from the physical world. This was illustrated in the paper where it was shown that employees experienced the organic logic of social information architecture in social enterprise media as difficult to understand, referring to it as a 'strange world'. Previous experiences with similar services were drawn upon when new ways to navigate and organize information were presented, illustrating that practices are learned (Giddens 1984[r]; Wittgenstein 1972[r]; 2000[r]) and that previous experiences are employed by participants, who are looking for family resemblances from the known when meeting new logics.

The conversation logics described in detail by Goffman (1959[r]) and developed further by Giddens (1984[r]) were shown to come to play in the virtual social enterprise media space. Employees reflexively monitored their conversations in accordance to the virtual context they were present in (e.g., smaller groups or open spaces). Groups in the enterprise platform provided trustworthy, smaller spaces and a better overview of the group members. Master keys in social enterprise media are inspired by characteristics from social groups and social interaction (e.g. conversations, sharing, presence (Kietzmann et al. 2011[r]), yet the open virtual social enterprise media space lack key elements present in the physical world, such as the contextual settings that allows us to create and establish new relationships and future relationships, or to know who is listening to our conversations. Few spaces, to reference Giddens's (1984[r]) ideas from Hägerstrand (1975[r]), are provided in the platform to nurture the establishment of new meetings with the key characteristics that Fayard and Weeks (2007[r]) list for nurturing informal conversations: spontaneity (a space that people naturally pass by), privacy (control of the boundaries of conversations) and legitimacy (a good reason for people to come by).

Who works where (what office) and with what is information that provides a spatial understanding of others for the employee. The virtual social enterprise media space do not provide any structure that enables such an overview of where other employees and other content reside. The flat structure does not assist the platform visitor with where he or she is, and where and who others are (except in groups). The social architecture is also experienced as difficult to navigate and search because it does not offer a spatial sense of where the user and content are located. This presents a

risk that employees do not find information or content, and one piece of advice to have in mind is that social enterprise media represent some key challenges to findability. These platforms should thus perhaps be a substitute to, rather than a replacement of, existing hierarchical intranets.

To conclude, key features in social enterprise media (e.g., transparency) collide with how space is constructed in the physical world (e.g. closing the door behind you to provide privacy from others or to lower your shoulders), and with the logics at play in conversations and social interactions (e.g. turn-taking in conversations and the opportunity to withdraw from conversations and to signal absence to other conversation partners). The social architecture and people-centric model in the virtual social enterprise media is not embedded by a spatial sense that makes navigation intuitive, nor does it provide logics that correspond with known and familiar logics or established communication and interaction practices among employees. This suggests that smaller interaction-spaces could be a next step for developers and designers to address; consideration should be given to features that nurture conversation logics as described by Goffman (1959[r]) and further developed by Giddens (1984[r]), as well as the importance of creating virtual spaces that nurture spontaneity, privacy and legitimacy, as described by Fayard and Weeks (2007[r]). The visibility of others' interactions nurtures a sense of co-presence and real-time. These are examples of what might be seen in the next versions of social enterprise media. Nonetheless, virtual spaces in social enterprise media need to be constructed in ways that enable opportunities for action and social interaction, and technical features need to be designed in ways that enable people to accidently bump into others and meet new people.

This study is not without limitations. Although the logics in various social software share some key characteristics, only one social platform (Jive Business Software) was analyzed in this study. Future research should examine different kinds of social working tools used by teams or social platforms with a smaller scale of users.

Acknowledgments
This research was founded by the NETworked POWER-project supported by the Norwegian Research Council. I would like to thank Associate Professor Marika Lüders at IMK, UiO, which interviewed nine of the 27 participants in this study. In addition, I would like to thank the reviewers for very useful feedback.

References

Akrich, M. 1992. The De-Scription of Technical Objects. In Shaping Technology/Building Society: Studies in Sociotechnical Change, edited by W. Bijker and J. Law, 205-224. Cambridge, MA: The MIT Press.

Barassi, V. and Treré, E. 2012. Does Web 3.0 come after Web 2.0? Deconstructing theoretical assumptions through practice. New Media & Society, 14, 1269–1285.

Boczkowski, P. , and L. A. Lievrouw. 2007. Bridging STS and Communication Studies: Scholarship on Media and Information Technologies. In The Handbook of Science and Technology Studies, edited by Edward J. Hackett, O. Amsterdamska and Michael E. Lynch, 949-977. Cambridge, US: The MIT Press.

Bloor, David. 1973. Wittgenstein and Mannheim on the Sociology of Mathematics. Studies in History and Philosophy of Science, Part A 4 (2):173-191.

Brandtzæg, Petter Bae, Marika Lüders, and Jan Håvard Skjetne. 2010. Too many Facebook "friends"? Content sharing and sociability versus the need for privacy in social network sites. Intl. Journal of Human–Computer Interaction 26 (11-12):1006-1030.

Brown, D. 2010. Eight principles of information architecture. Bulletin of the American Society for Information Science and Technology, 36, 30–34.

Collins, Harry. 2011. Language and practice. Social Studies of Science:0306312711399665.

Dunbar, Robin, and Robin Ian MacDonald Dunbar. 1998. Grooming, gossip, and the evolution of language: Harvard University Press.

Duyne, Van, Landay, and Hong. 2002. The design of sites: patterns, principles, and processes for crafting a customer-centered Web experience: Addison-Wesley Longman Publishing Co., Inc.

Ellison, Nicole B. 2007. Social network sites: Definition, history, and scholarship. Journal of Computer-Mediated Communication 13 (1):210-230.

Fayard, A.L. and Weeks, J. 2007. Photocopiers and water-coolers: The affordances of informal interaction. Organization Studies, 28, 605–634.

Garrett, J.J. 2003. Elements of User Experience, The: User-Centered Design for the Web and Beyond. Aiga New Riders, USA.

Giddens, A. 1979. Central Problems in Social Theory: Action, Structure and Contradictions in Social Analysis. University of California Press.

Giddens, A. 1984. The Constitution of Society: Introduction of the Theory of Structuration. University of California Press.

Giddens, A. and Pierson, C. 1998. Conversations with Anthony Giddens: Making Sense of Modernity. Stanford University Press.

Goffman, E. 1959. The Presentation of Self in Everyday Life. Doubleday, Garden City, NY.

Gumperz, J. and Cook-Gumperz, J. 2008. Studying language, culture, and society: Sociolinguistics or linguistic anthropology? Journal of Sociolinguistics, 12, 532–545.

Hackett, Edward J, Olga Amsterdamska, Michael Lynch, and Judy Wajcman. 2007. The handbook of science and technology studies: The MIT Press.

Hägerstrand, T. 1975. Space, time and human conditions. In: Dynamic Allocation of Urban Space, Karlquist, A. (ed.). Farnborough: Saxon House.

Hägerstrand, T. 1978. Survival and arena: on the life-history of

individuals in relation to their geographical environment. In: Human Geography and Time Geography, Al, C.E. (ed.).

Helle-Valle, Jo. 2010. Language-games, In/dividuals and Media Uses: What a Practice Perspective Should Imply for Media Studies. In Theorising media and practice, edited by Birgit Brauchler and John Postill, 191-213. New York Oxford: Berghahn Books.

Jarzabkowski, Paula, and Trevor Pinch. 2013. Sociomateriality is 'the New Black': accomplishing repurposing, reinscripting and repairing in context. M@n@gement 16 (5):579-592. doi: 10.3917/mana.165.0579

Johnson, Jim. 1988. Mixing humans and nonhumans together: The sociology of a door-closer. Social problems 35 (3):298-310.

Jones, M.R. and Karsten, H. 2008. Giddens's structuration theory and information systems research. MIS Quarterly, 32, 127–157.

Kietzmann, J.H., Hermkens, K., McCarthy, I.P. & Silvestre, B.S. 2011. Social media? Get serious! Understanding the functional building blocks of social media. Business Horizons, 54, 241–251.

Latour, Bruno. 1992. Where Are the Missing Masses? The Sociology of a Few Mundane Artifacts. In Shaping technology/building society: Studies in Sociotechnical Change., edited by W. Bijker and J. Law, 225-258. Cambridge, MA: The MIT Press.

Lenntorp, Bo. 2004. Path, prism, project, pocket and population: an introduction. Geografiska Annaler. Series B. Human Geography:223-226.

Leonardi, P.M., Huysman, M. and Steinfield, C. 2013. Enterprise Social Media: Definition, History, and Prospects for the Study of Social Technologies in Organizations. Journal of Computer Mediated Communication, 19, 1–19.

McAfee, A. 2009. Enterprise 2.0: New Collaborative Tools for your Organization's Toughest Challenges, Harvard Business Press.

Nandhakumar, J. 2002. Virtual teams and lost proximity. Virtual Working: Social and Organisational Dynamics, 46.

Orr, J.E. 1996. Talking about machines: An Ethnography of a Modern Job. Cornell University Press.

Pelto, P.J. and Pelto, G. 1978. Anthropological Research: the Structure of Inquiry. Cambridge University Press, Cambridge, NY.

Pettersen, L. 2014. From Mass Production to Mass Collaboration: Institutionalized Hindrances to Social Platforms in the Workplace. Nordic Journal of Science and Technology Studies, 2(2), 29-40.

Pettersen, Lene. 2016. Local Villages in a Globally Connected Structure–a Case Study of Social Enterprise Media in the Multinational Workplace. Proceedings of the 7th 2016 International Social Media & Society Conference, ACM. London, UK.

Quan-Haase, Anabel, and Barry Wellman. 2006. Hyperconnected Net Work. Computer-Mediated Community in a high-tech Organization. In The Firm as a Collaborative Community: reconstructing trust in the Knowledge Economy, edited by Paul S. Adler and Charles Heckscher, 608. Oxford University Press.

Rosenfeld, L. and Morville, P. 2002. Information Architecture for the World Wide Web. O'Reilly Media, Inc.

Schiltz, M., Truyen, F. and Coppens, H. 2007. Cutting the trees of knowledge: Social software, information architecture and their epistemic consequences. Thesis Eleven, 89, 94–114.

Suchman, L. A. 1995. Making work visible. Communications of the ACM, 38, 56–ff.

Song, F. W. 2010. Theorizing web 2.0: A cultural perspective. Information, Communication & Society 13 (2):249-275.

Tredinnick, L. 2006. Web 2.0 and Business: A pointer to the intranets of the future? Business Information Review, 23, 228–234.

Wittgenstein, L. 1972. Philosophical Investigations. Blackwell, Oxford.

Wittgenstein, Ludwig. 2000. Bemerkninger om fargene (original: Bemerkungen die Farben/Remarks on color), Etterord av Stian Grøgaard. Norway: Pax forlag.

Woolgar, Steve. 1990. Configuring the user: the case of usability trials. The Sociological Review 38 (S1):58-99.

Yanow, D. 2006. Talking about practices: On Julian Orr's talking about machines. Organization Studies, 27, 1743–1756.

Yin, R.L. 2012. Applications of Case Study Research. SAGE Publications, Thousand Oaks, CA.

Zheng, J., Veinott, E., Bos, N., Olson, J.S. and Olson, G.M. 2002. Trust without touch: jumpstarting longdistance trust with initial social activities. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, ACM, 141–146.

NORDIC JOURNAL
of Science and Technology Studies

DOMESTICATING HOMECARE SERVICES

Vehicle Route Problem Solver Displaced

by Jenny M. Bergschöld

This article presents a case study of a vehicle route problem solver in the context of homecare work. Vehicle route problem solvers are technologies that calculate geographically rational driving routes. Primarily framed as tools for financial control, they have been tested in homecare services with good results under controlled circumstances. However, they have not been studied as part of users' everyday work after implementation. The case study shows how, through processes of domestication, the vehicle route problem solver becomes unable to provide homecare workers with 'optimal' driving routes. Additionally, it shows how this 'malfunction' renders it understood as inconsequential to the very activities it was designed to support which ultimately leads to its removal from driving route production processes. The results highlight the importance of carefully studying how vehicle route problem solvers and other technologies interact with the everyday lives of those who are meant to benefit from them.

Keywords: Domestication, Vehicle route problem solver, Homecare services, Posthumanism, Welfare technologies

Author: Jenny M. Bergschöld
Department of Interdisciplinary Studies of Culture,
Norwegian University of Science and Technology, 7491 Trondheim, Norway.
jenny.bergschold@ntnu.no

Introduction

The Norwegian population is aging and Norwegian welfare services for the elderly are extensive. As a result, Norwegian municipalities are anticipating escalating costs and searching for ways to manage this. Vehicle route problem solvers (VRP-solvers) are implemented in the belief that they will save on resource expenditure, thus lessening the financial burden (Ministry of Health and Care Service 2012[r]). As such, VRP-solvers are part of the increasing trend of adopting New Public Management (NPM) inspired means (Szebehely 2005[r]; Trydegård 2012[r]; Vabø 2005[r]; 2007[r]; 2009[r]) to govern the welfare state.

VRP-solvers are technologies that are capable of calculating 'optimal' driving routes by drawing on geographical data. Additionally, it renders the driving routes available to homecare workers in the form of schedules. Often by way of a handheld unit. Tests have shown that VRP-solvers are able to reduce time spent planning driving routes and traveling between care recipients' homes by at least 7% and at least 20% respectively (Eveborn, Flisberg, & Rönnqvist 2006[r]). The question that remains, however, is what happens after implementation?

Homecare workers were found to spend considerable time and effort correcting the driving routes incurred by, what seemed to be a 'malfunctioning' VRP-solver. To study the use of the VRP-solver and its implications, this study draws on domestication theory (Berker, Hartmann, Punie, & Ward 2006[r]; Lie & Sørensen 1996[r]; Sørensen, Aune & Hatling 2000[r]). Domestication theory argues that implementation of technologies can never be assumed to be rational, linear, or monocausal, as user-technology relationships are always sites of innovation where reality is produced through mutual adaption.

The next section elaborates on Norwegian homecare services and VRP-solvers. Subsequently, domestication theory and research methods are described. Then, concepts from this theoretical framework are applied in the study of a VRP-solver in a homecare service unit in Norway. Finally, the last section discusses the findings.

Vehicle route problem solvers in homecare services

In Norway, homecare services are part of the municipal health and social services. Homecare services include medical assistance, as well as other types of services. They are provided to people whom, due to illness, disabilities, or other issues, are unable to manage daily activities on their own. Help provided by homecare services includes, but is not limited to: wound care, administration of medicines, personal care, assistance with preparing and eating meals, medical observation, personal hygiene, laundry, food preparation, and dishwashing.

A considerable amount of homecare work is performed outside of immediate interactions with care recipients. Part of this work is the transportation to and from care recipients' homes. Planning driving routes is a complex and time-consuming task. It requires that the persons responsible consider the tasks to be performed for each client, the level of professional knowledge required for those tasks, and the distance between each residence. In addition, some tasks are particularly time-sensitive, such as the administration of medication at set times, or the providence of basic everyday tasks including getting out of bed, performing personal hygiene, or getting dressed. However, workers may not always be on time and care recipients must often adjust to the temporal rhythm of the organization regarding when such assistance can be delivered (Leppänen 2005[r]).

Homecare work simultaneously comprises 'caring for' and 'caring about' (Ungerson 1983[r]). While formally concerned with practicalities, homecare work involves other aspects too. Many studies in the field of homecare service studies have demonstrated that homecare work also involves and depends on emotional labour. Such emotional labour may include provision of comfort, empathy, and shared joy and sometimes occurs at the expense of homecare workers well-being[1].

Homecare work is much like any frontline human service work, where 'street-level bureaucrats' (Lipsky 1980[r]) provide services to dependent recipients. It is a form of work that implies the application of some form of moral judgement (Hasenfeld 1983[r]; 1992[r]). Ultimately, these practices form the final policy product which is delivered to the public (Lipsky 1980[r]). This means that homecare work, including travelling between care recipients' homes, is not merely a matter of logistics, but also a matter of care and ethical concern. Similarly, the issue impacts workers' conditions of labour. Consequently, to frame any aspect of homecare work in purely quantifiable terms is inevitably reductionist.

The Norwegian government places critical importance on managing the tensions between its limited sources and its increasing ageing population. As lifespans increase and medical technology allows for better diagnoses, the clientele to whom welfare organizations must cater is growing rapidly (Ministry of Health and Care Service 2012[r]) and the population is encouraged to remain in their own homes throughout the ageing process as opposed to moving into institutional homes. Thus, in Norway, ageing entails becoming increasingly reliant on homecare services to manage everyday life and a well-functioning homecare service is of vital importance.

As municipalities seek to cut costs, many homecare service organizations have implemented VRP–solvers. In the field of management and operations research, the issue of creating optimal service routes is known as the 'vehicle route problem(s)', or 'VRP' (Dantzig & Ramser 1959[r]). The following section demonstrates

1 See e.g. Astvik 2000[r]; 2002[r]; 2003[r]; Barer 1992[r]; Davies 2001[r]; Eliasson 2000[r]; Fahlström 1999[r]; James 1992[r]; Petersson, Leppänen & Jönsson 2006[r]; Szebehely 1995[r]; Wærness 1984[r].

how VRP is described in the field in general and in relation to homecare services.

The basic model of VRP is the Capacitated VRP (CVRP). The CVRP describes fleets of identical vehicles located at a central depot that need to be optimally-routed to supply a set of customers with known demands. Each vehicle can only perform one route and the total number of customer deliveries cannot exceed the fleet capacity. A variety of the CVRP is the 'VRP with Time Windows' (VRPTW) which expands the basic CVRP by imposing the condition that each customer is visited within a specific time interval (Baldacci, Mingozzi, & Roberti 2012[r]). Toth & Vigo (2001[r]) describe how the VRP can be understood as composed of five basic components: road network, point of service delivery, depot, vehicles, and drivers. All of these components are subject to constraints that can influence the calculation of the optimal route. In the context of homecare services, these constraints includes visits to care recipients being scheduled at precise times, this may be due to medical issues but may also include other reasons. Such time windows place constrains on the system because they influence the order of visits. Medical deliveries to care recipients may involve going to another location before travelling to the client recipients' home, which will also influence the order of visits. The vehicular and driver capacity of the depot may differ each day, and staff working hours may impose a constraint on the fleet capacity. Such constraints and many others create different problems which must be solved as part of the driving route planning process.

The VRP problem and its varieties are well researched[2], in terms of the mathematical complexities involved scheduling operations in home health care services[3]. However, only a few studies describe VRP-solvers after implementation in the practices of delivering homecare services to care recipients, and those that do have only tested the technology under controlled circumstances.

Eveborn et al. (2006[r]) describe the development and testing of a VRP-solver which they refer to as 'Laps Care'. They demonstrate a 7% decrease in total working time for the unit, a 20% decrease in travelling time, and that gathering staff members for 30 to 45-minute long morning meetings can be reduced to a fraction. Similarly, Angelsen (2013[r]) reports successful results of a project that developed and demonstrated a VRP-solver in the form of a web-based geographical information system specifically developed for Norwegian homecare services. Design and development processes were based on dialogue with representatives from the Development Center for Homecare Services Nordland.

Both VRP-solvers described in these studies draw on geographical data in order to provide homecare workers with a schedule that is constructed around the geographically-optimal driving route, while considering that visits to care recipients' homes must occur at particular times. In addition, the above described studies have demonstrated substantial time saving on driving routes when calculations adopt precise geographical data rather than estimates.

However, studies of VRP-solvers consistently scope results in a reductionist manner, merely relating them to financial gain. Moreover, the results are embedded in the implicit assumption that the implementation and use of technologies is linear, rational, and monocausal. In other words, they imply that technologies are impervious to their social context and user-technology interactions, and are merely carriers of reliably predictable outcomes. While there is no denial that technologies are forceful actors, domestication theory entails a protest against the notion that this forcefulness can be assumed to be inherent in the technology itself (Sørensen 2006[r]).

Domestication

In the field of social studies of technology, domestication theory is part of a sociotechnical approach that perceives technology and society as mutually shaping one another (Bijker, Pinch, & Hughes 1987[r]). Domestication theory suggests that we study user-technology relationships as sites of innovation and productions of everyday life. Originally developed in a collection of empirical studies in the field of media and communication studies (Silverstone & Hirsch 1992[r]) more contemporary accounts of this theoretical framework has inspired empirical research in variations of mutual adaption between technologies and social contexts for a wide variety of technologies[4].

Domestication studies in the field of social studies of technology focus on three main features of the co-production of the social and the technical: 1) Sets of practices related to an artefact, 2) the construction of meanings, including the role the technology may play in relationship to actors' identity production and 3 processes related to learning (Sørensen et al. 2000[r]). This particular 'flavour' of domestication studies engages with ideas from Actor-Network Theory (ANT) and semiotic approaches to understanding technologies (Akrich & Latour 1992[r]; Latour 1988[r]; 1992[r]). In this version, domestication studies emphasise the construction of everyday life and are less concerned with the household or consumption (Sørensen 2006[r]).

The concept of a 'script' (Akrich 1992[r]; Akrich & Latour 1992[r]) may be used to describe the sociality/agency of technologies in user-technology practices. When objects are designed, the manner in which they are meant to interact with users and vice versa is inscribed in their physical form and function. In this manner, the

2 See Toth & Vigo (2001[r]) for a comprehensive overview of the field, or Baldacci, Mingozzi and Roberti (2012[r]) for a more recent account
3 See e.g. Nickel, Schröder and Steeg (2012[r]); Cheng and Rich (1998[r]); or Bertels and Fahle (2006[r])
4 Berker et al. (2006[r]), Levold & Spilker (2007[r]) and Lie & Sørensen (1996[r]) are three useful anthologies for those interested in overviews

design of an artefact defines actors with 'specific tastes, competences, motives, aspirations, political prejudices [...] thus like a film script technical objects define a framework of action together with the actors and the space in which they are supposed to act' (Akrich 1992[r], 208).

Scripts are based on designers' understandings of users and their needs. Such understandings may come from informal inquiries, or more formal procedures such as market surveys and user trials (Akrich 1995[r]). When technologies are used, they are interpreted by their users. An important influence from ANT is the idea that scripts can be contested by users who consciously seek to override inscriptions (Sørensen 2006[r]). While designers' scripts and users' interpretations may coincide, it is common for the original script to become the subject of negotiations (Berker 2011[r]). For example, users may avoid using certain functions, or develop methods of 'tricking' or ignoring the script to produce desired results. Such actions may be understood in terms of a process where the technology is re-engineered (Sørensen 2006[r]). In theoretical terms such 'tinkering' with the original script is here understood as *anti-programs* (Latour 1991[r]).

Another important contribution from ANT is the understanding that 'mutual adaption' is the complex movement of objects into and within existing sociotechnical configurations. Domestication of a technology may be understood as the phenomenon where a script is re-engineered in user-technology relationships, and becomes associated with practices, meanings, people, and other artefacts to form unpredictable heterogeneous networks of humans-devices-knowledges-institutions (Sørensen 2006[r]; Sørensen et al. 2000[r]). Networks are performed as users draw on symbolic, practical, and cognitive resources, and are rendered empirically visible as observable patterns of use (Sørensen et al., 2000[r]). Such heterogeneous outcomes may also be understood as *cyborgs* (Haraway 1987[r]) or monsters (Law 1991[r]). At this point, the technology has gone beyond the boundaries of a single device to become a different entity (Haddon 2006[r]). As actors move into, out of, or within networks, they change. Thus, actors are 'fluid' although they may become stabilized in networks (De Laet & Mol 2000[r]; Mol & Law 1994[r]). From this perspective, sociality or agency does not designate a domain of reality or individual traits of actors, but 'a movement, a displacement, a transformation, a translation, an enrolment' (Latour 2005[r], 64). Crucially then, the enactment of technology is equally dependent on the script and what the user does with this inscription (Latour 1991[r]). For example, studies of television sets in domestic settings show how the placement of the TV contributed to its uses and meanings, as well as the production of everyday life (Sconce 2000[r]; Spigel 1992[r]).

Jelsma (2003[r]) shows how scripts can be understood as revealing of the morality of devices. A 'strong' script may offer few alternative actions, while a 'weaker' script may be understood as less normative of user actions (Latour 1992[r]). Nevertheless, even strong scripts are mediating but not determining of user practices (Jelsma 2003[r]). Domestication studies understand user-technology relationships as unpredictable sites of innovation. However, 'unpredictability' here does not merely refer to the configuration of networks also but to their outcomes which may have *trickster* qualities (Haraway 1991[r]), meaning that implications may be unpredictable even to users themselves (Berker 2011[r]).

Method and case description

Theory application in studies of domestication is a methodological issue (Hartmann 2006[r]). Users are experts on the implicit conditions of using their technologies in the course of their everyday lives. However, when technologies have become domesticated, users' knowledge of what or why something is done when engaging with the technology may have become tacit. Arguably then, domestication studies require repeated engagement with the participants, preferably in the course of on-going practices as this accommodates questions which may elicit such tacit knowledge. For this reason, I employed a research strategy that combined participant observations of regularly reoccurring practices of use with questions regarding users' on-going activities and choices.

The empirical material was collected during the autumn of 2015 and focuses on two different types of use and users in a homecare service unit in a Norwegian municipality. The analysis is explorative and based on abductive inferencing (Reichertz 2007[r]). The material was coded using emic as well as etic codes. Emic coding served to identify practitioners' perspectives on the domestication of the VRP, while etic coding served to integrate the same with the theoretical framework. During fieldwork the emerging material was continuously subjected to open coding using emic codes. Etic codes derived from domestication theory served in the checking process. This type of analytical procedure may be described in terms of social constructionist grounded theory (Bryant & Charmaz 2010[r]; Charmaz 2014[r]). The material was constructed using a combination of participant observation and qualitative interviews. Participant observations enabled a focus on procedures of scheduling as processes of using technologies in practice. Additionally, questions, which sought to encourage homecare workers on-going reflections regarding their actions and choices, were asked throughout those observations. Due to privacy concerns, identifying features such as the names of participants and the geographical location of the unit in question have been anonymized.

As part of a larger project concerned with the delegation of work to technologies in the Norwegian welfare state, the fieldwork for this study started out as an exploration of sociotechnical processes in homecare work with and without clients. No specific technology or process was selected for study prior to commencing fieldwork. I contacted several homecare service units, described my interest in studying technologies in homecare service work with and without clients, and asked if it would be possible for me to accompany one or several homecare service workers in the course of their work to 'observe and ask questions'. I was able to gain access to

a homecare service unit after only a few attempts. I also negotiated the conditions and terms of my participation in procedures with the individual research participants. I would then ask if I may accompany them to study 'the role of technologies in their work with and without clients', and when doing so 'take notes of everything that happens in the course of the day, ask questions, and make audio recordings of our conversations'. All homecare service workers who were approached agreed to participate.

A participant observation covered the entire working day. This means that observations started at the point when workers arrived at the offices at the start of their shift and ended at the point when they left for the day. The size of the sample included in this article may be described in at least two ways. One way would to be to say that this is a study where observations were conducted and questions asked during an 8 hour long working day for one planner and seven meetings where 20-25 homecare workers simultaneously corrected driving routes. Some of those homecare workers were the same from time to time, some were not. In total the sample comprised the planning activities of 57 individuals. Another way of describing the size of this study would be to describe it in terms of its possible implications for care recipients. During each of the 7 meetings that were observed, 20-25 homecare workers rearranged the driving routes for 7-12 care recipients per homecare worker.

After completing an observation, I would immediately seek out an isolated place to complete my field notes, expanding on the shorthand notes I had collected throughout the day. I would add initial analytical reflections to my field notes and take note of future questions to be asked. Typically, this treatment took three to four hours and resulted in eight to nine pages of typed text. All audio recordings were transcribed *ad verbatim* by myself or by an assistant.

While the focus of the initial observations and questions regarding procedures was 'the role of technologies in homecare work with and without clients', it soon became apparent that a subsection of this field was of great importance to the participants. It turned out that all homecare workers spent considerable time every day correcting mistakes in their driving routes. Despite the fact that the organization had implemented a VRP-solver. On noticing this, I focused my observations on how these problems were handled and made the effort to explore how and why the VRP-solver 'malfunctioned', by observing how the planner used the technology to make schedules. During these observations, I paid particular attention to any understandings related to why the VRP-solver had to be used in this particular manner, even though it clearly meant that resultant driving routes would be problematic.

The VRP-solver studied here is a software with two sets of user interfaces split over two types of hardware. One in the form of a software installed on a PC while the other is in the form of a handheld extension of the same software but installed as a smartphone app. In the PC version, the software consists of a planning interface which allows 'planners' (i.e. employees) tasked with the production of schedules for homecare workers to plan visits to care recipients and draw on geographical data to ensure that schedules constitute geographically-rational driving routes. When the system is first installed, the user registers the data of employees (i.e. form of employment, availability, etc.) and care recipients (i.e. tasks to be performed by the homecare workers during the visits, medical information, address, phone numbers, etc.). In addition to the data entered by the user, the system contains geographical information in the form of maps with detailed information of the road network. As users enter care recipient data, the system matches addresses with positions on the map and calculates the travel time between them.

Homecare workers work with the handheld extension of the software. The handheld device provides the user with the opportunity to view the schedule as a list and as a driving route which is displayed on a map. Together, these two features comprise the VRP-solver. However, the handheld device also includes several other functions, such as the opportunity to view and write information relevant to the tasks performed with care recipients. In addition, the handheld unit holds specific material properties. Such complexity is typical for many modern ICTs and may be understood in terms of two main observations: Firstly, it has the capacity to house much information in a 'small package'; Secondly, it is mobile and easy for homecare workers to carry around in the course of their work.

Domesticating the vehicle route problem solver

I'm attending a routine 30-minute meeting which marks the start of every shift. I'm sitting at the table with a homecare worker and her handheld device, both of whom I'll be accompanying today. We are in a room with four tables and every seat is equipped with a printed schedule with the employees' name at the top, a pen, and a bunch of keys. While relatively quiet, the room is brimming with activity. Everybody is busily writing in the margins of their schedules.

The schedule that this homecare worker is working today adds up to 3 hours and 40 minutes' worth of tasks to be performed at 10 different addresses in the 4 hours before her lunch break. At lunch, she will receive a new schedule for her afternoon. Her first client visit is scheduled at 0800hrs, which is also when the morning meeting ends.

The homecare worker is writing the new order of client visits [2,6,8...] in the margin of the printed schedule. 'I'll talk to you in a moment, I just have to figure this mess out first', she says. She is familiar with the addresses and so knows how much time the drive will take – 'well, approximately at least!' – and how she can save time. Some re-orderings move clients from the end of the list to the beginning, some are only moved slightly,

but all are rearranged. Around us the other members of the shift-team are working on their own schedules while drinking their morning coffee. All work is performed on paper. The handheld devices remain untouched.

The travel time between care recipients' homes is not accounted for within the time frame designated in each shift. The 'mess' to which the homecare worker is referring, is that as a result the schedule does not reflect the reality of homecare workers. They are thus tasked with finding a manner of physically transporting themselves between care recipients' homes, within the timeframe at their disposal. To 'figure out' the mess means to find a way of enabling oneself to do so. When homecare workers were asked to reflect on the necessity of performing such manual corrections of the driving routes, they often responded by explaining why it was important to them that the driving routes were functional, as well as how a functional driving route is ideally configured.

> *'Well it [the schedule] is our main tool when we work so it is important that there is a flow, you know… [So] that there is not, well, not one stop there and then we have to go all the way in the other direction, and then back again. So we need to put it together in an 'okay' manner, otherwise we won't be able to make it in time'.*

In the course of this explanation, the homecare worker points to the three first names on her schedule, implying that the geographical distance between them is not only far, but also arranged in a manner which disrupts 'flow'. From this illustration, corroborated by many similar explanations from other homecare workers, it is possible to infer three main observations of the homecare workers' situation. Firstly, homecare workers require a driving route with 'flow' for them to be able to perform all visits to care recipients' houses within the time frame at their disposal; Secondly, a driving route that 'flows' arranges visits to care recipients in an order which privileges geographical location; Thirdly, the schedules handed to homecare workers at the start of their shift usually do not 'flow'.

To the homecare workers, the functionality of driving routes seemed limited to this notion of 'flow'. Notably, the reorganization of the driving route privileged geographical rationality and finishing on time over care-related issues, such as the timeliness of visits. This is potentially problematic as the timeliness of visits to care recipients is, amongst other things, tied to the administration of medicines, the changing of diapers and catheters, the help to get out of bed and start one's day, the provision of meals, and clients' rights to be able to live and plan life autonomously. Moreover, that homecare workers experience a need to geographically optimize driving routes manually is a somewhat surprising find in a homecare service unit where a VRP-solver that draws on geographical data to perform this very task has been implemented. Nevertheless, the observation made on that first day turned out not to be a unique case. At the start of every shift, all homecare workers in this unit routinely spent approximately 30 minutes correcting the mistakes of what was clearly a malfunctioning VRP-solver in order to construct 'flow'.

Unravelling the 'malfunctioning' Vehicle Route Problem Solver

The homecare workers' explanations were often practically oriented towards the nature of their problem and their understanding of what their activities needed to achieve. However, the planners' answer to questions concerning the time estimates allotted for travelling offers a somewhat different perspective on the social circumstances in which the VRP-solver has been implemented.

The interface is similar to a Gantt chart. All schedules are visible on the screen. Each schedule is a horizontal bar that represents the timeline of the relevant shift, e.g. 0800hrs to 1200hrs. Planning starts by importing all of the relevant visits to care recipients' homes to the interface. They pool at the bottom of the interface, which is also organized like a bar along a timeline. To make the schedules, the planner drags care recipients' names from the pool at the bottom of the screen and drops them the individual schedules. This means that if a name is dragged from the 0800hrs mark in the pool, it also dropped at the 0800hrs mark in one of the schedules. Every time a name is added to one of the schedules, the program sums up the total amount of time in terms of tasks to be performed during the visits, and does this for each individual schedule. She keeps adding visits to the schedules until the sum of each schedule is approximately 3.5 hours. This makes for a blanket estimate of 30 minutes of travelling time per schedule. When all the schedules are complete, they are printed, labelled with each homecare workers' names in handwriting, and neatly stacked in preparation for distribution to homecare workers at the start of the next shift.

> **J.:** *Is 30 minutes enough time to visit all of the care recipients?*
> **Planner:** *No, not really but it has been decided by the municipality [the municipal administration].*
> **J.:** *Oh?*
> **Planner:** *We are not allowed to [include driving time when making the schedules]. We are only supposed to include direct time [spent in direct interactions with care recipients] […] about 3.5 hours per schedule […]. Of course, it [the driving route] gets all wrong, but that is how it has been decided and then there is nothing we can do.*

While the VRP-solver is theoretically capable of producing schedules that are calibrated around the most efficient driving route by drawing on geographical data, the planner describes how she is unable to reproduce that script (Akrich 1992[fr]; Akrich & Latour 1992[fr]) because she has been instructed to not include driving time on the schedules. Instead, all schedules are planned on a blanket assumption that driving time will take 30 minutes. However, while the planner conveyed her acceptance of this rule, the issue is still perceived as problematic:

> **Planner:** *But then we say 'and how are we supposed to manage then?', but they don't care about that. It's just how it is going to be. So the issue with the time spent on travelling has been raised many times, but yeah. That's how it is. I mean the [municipal] politicians, right? They instruct those who are responsible for us [the homecare services]. And then our administrative manager, she has [name of*

municipal director of Health and Welfare services] who sits down in City Hall, that is her boss. So he tells her, and then she tells our operative manager, and she tells us. And that is how it goes.
J.: *So this is a long-standing struggle?*
Planner: *Yeah, it's a reoccurring discussion but we [planners in the municipality] are not allowed [to calculate the travelling time], so there isn't much we can do.*

The question of calculating as opposed to estimating driving routes is a long-standing struggle. The instruction is understood by the planner in terms of a problematic and political intervention in daily homecare service operations where the homecare workers, the planner and their manager is on one side and the municipal politicians is on the other. While relevant decision-makers have been informed that the blanket estimates are disruptive to the point where homecare workers question their ability to manage their work, the attempts to change the directive have so far been unsuccessful. It would not be unreasonable to presume that such a refusal may be related to an interest in resource savings.

Since the planner is prohibited from using the technology to calculate the driving routes, she uses other methods to approximate a geographically-optimal route as best as she can. When she drags and drops care recipients' names from the pool at the bottom of the interface, she tries to keep the clients that live in the same direction on the same schedules. In this way, routes are roughly kept within the same geographical area of the district that the unit must cater to. While we cannot assume that the instructions are made from a position of knowledge in relationship to the exact mechanics of the software, these instructions nevertheless shape the relationship between the planner and the VRP-solver in a specific manner. It produces a constraint that renders the planner unable to draw on geographical data whilst making schedules. However, they do not prohibit her from using the software altogether.

Using a Vehicle route problem solver without drawing on geographical data

As described in the excerpt from field notes included above, the planner at this particular homecare service unit has a method for using the VRP-solver to make schedules without drawing on geographical data. To accomplish this, she uses a feature in the software that allows her to 'switch off' map data, thus removing geographical data from the configuration. By doing so, it is possible for her to input a set value of 'direct time' – that is, time spent in interaction with clients. When this feature is used, the system does not include calculations of travelling time in the schedules. Instead, the system merely calculates the total amount of direct time added to each schedule. When names of care recipients are dragged from the pool and dropped into individual schedules, the system adds the time estimate of the tasks that are to be performed during that particular visit, to all of the previously added visits to care recipients along that particular route. This calculation is displayed in the form of a number that goes up every time a visit is added. If the total amount of time adds up to more than 3,5 hours the numbers turn red as an indication that no more visits may be added to this particular driving route.

As each schedule covers only four hours, this means that the system is effectively set to construct schedules around the parameter of traveling time using a blanket estimate of 30 minutes, and to disregard the geographical distance between the care recipients' homes. After all of the schedules have been finished, they are printed, labelled with each homecare workers' name in handwriting and neatly stacked in preparation of the routine of manual geographical optimization at the start of the next shift.

The planners' ability to draw on a feature to exclude geographical optimizing from the process of crafting driving routes may be understood in terms of a weak script (Latour 1992[rf]) in the sense that it allows for a larger degree of flexibility in the relationship between the user and the technology. This weak script (Latour 1992[rf]) allows the user to re-engineer (Sørensen 2006[rf]) the technology from VRP-solver, to a device which merely counts the total amount of hours and minutes in client interactions. In this case, the planner uses this flexibility to disable the VRP-solver, thus effectively displacing (Latour 2005[rf]) the part of the software that is concerned with VRP-solving. It is this displacement that enables her to simultaneously follow instructions and use the software, even when she is prohibited from basing the driving routes on calculations. Angelsen (2013[rf]) describes a similarly weak script (Latour 1992[rf]) in the form of a feature which allows the planner to override VRP-solving by entering set parameters. It may thus be presumed that such weak scripts are possibly common and/or not coincidental.

Anti-programming the handheld unit

In this section, attention is turned from the planner and the PC-based user interface and to the homecare workers and the handheld user interface. As previously described, manual driving route optimization has become a part of everyday operations and is routinely performed at the start of every shift by the homecare workers. Every day, as the homecare workers arrive to work, they sit down at tables where every seat has been supplied with a set of tools: A handheld unit (which contains the schedules made by the planner, as well as details on the tasks to be performed during visits to care recipients), a set of keys, and a printed version of the schedule contained in the handheld unit and a pen. In order to correct the 'mistakes' in the driving routes, the homecare service workers reorder the client visits so that the order is set in a manner where client visits reflect the most rational geographical driving route, to the homecare workers' knowledge. By doing this, they enable themselves to 'make it in time'. This method of reordering the visits may be understood as a way for the homecare workers to empower themselves, not only in relationship to the 'faulty' schedule, but also in relationship to the hand held device itself.

The handheld device is, in essence, an extension of the VRP-solver in the form of a windows phone were an app is installed. Materialized in this manner, the VRP-solver is rendered mobile. In comparison

with the planners' PC-based VRP-solver interface, the handheld device only allows for a very limited set of actions in relationship to driving routes. Users of the handheld device may access and look at their own schedule. They may also look at other users' schedules. Users of the handheld device are however *not* able to change the order of visits, and they may not draw on geographical data to match the addresses on their list to their geographical positions in relationship to each other. These restrictions may be understood in terms of a script that contains rules about the manner in which users are meant to interact with the technology (Akrich 1992[r]), in this care which role homecare workers should have in relationship to driving routes. Relying on the implicit assumption that planners are able to produce optimal driving routes by drawing on geographical data when making schedules, these rules dictate that homecare workers should not make but only receive driving routes. From the perspective of the homecare workers, the logic embedded in the device, to order client visits by when they should occur and prohibit any alternative ordering, becomes a problem. A 'flaw' in the designers' script that must somehow be solved if they are to be able to perform all of the visits to care recipients on their route.

By renumbering the order in which they will visit clients in the margin of the printed list, homecare workers draw on their individual knowledge of the geographical area as a way of getting around these restrictions. This thus provides an antiprogram (Latour 1991[r]) to the LMP's script (Akrich 1992[r]; Akrich & Latour 1992[r]), which stops them from interfering with the driving route through the handheld device. By deploying the antiprogram (Latour 1991[r]), the homecare workers are able to render the handheld unit incapable of stopping them from interfering with the driving route. Thus the antiprogram (Latour 1991[r]) provides a means for the homecare workers to re-engineer (Sørensen 2006[r]) the technology and empower themselves in relationship to the script (Akrich 1992[r]; Akrich & Latour 1992[r]) by displacing (Latour 2005[r]) the handheld device from activities concerned with driving route problem solving.

The meetings during which the homecare workers optimize driving routes take approximately 30 to 35 minutes every shift. The routine of starting every shift with a meeting existed before the VRP-solver was implemented into the organization. Originally, these meetings provided an efficient manner of spreading information concerning any developments in care recipients' needs during the night or the shift before. After the implementation of the VRP-solver, this information is now available to the homecare workers in the handheld devices they carry. However, the implementation of the VRP-solver has not rendered the meetings superfluous to the operation of the homecare service unit. Instead, the time is used for the manual optimization of the problematic driving routes and so these meetings are still performed at the start of both shifts.

Understanding and attributing meaning to the technologies

However, aspects of the handheld device has nevertheless managed to enter into networks of practices. In some situations, the homecare workers unanimously praise the handheld device for its usefulness and the convenience it provides. More importantly, however, such accounts did not concern the part of the technology which is the VRP-solver. Users who were initially opponents to its implementation typically expressed how the handheld device was so useful to them that they would not be able to do their job without it. Sometimes, they would even express that they love it:

> **Homecare worker (HCSW)**: *It is super easy and really good to use, and I have to say that I was one of the biggest opponents.*
> **J.:** *You were? What did you picture as problematic?*
> **HCSW:** *That it was going to be too hard. I would have to learn a lot of new things, IT and stuff… Start to find where everything is on this thing, right, on [the LMP my note] this… thing! And then I thought to myself – shit, I'm supposed to have to fiddle with this and look for things? But then one evening shift I sat and just fidgeted a bit with it and then suddenly – 'damn! I can write a report on this!' And then I realized you know… and now I love it. I can't work without it*

The ability to write reports on the handheld unit was a highly appreciated feature, because it meant that workers no longer had to wait for one of the computers at the offices to become available, and thus saved them time. The ability to write reports immediately after visits, rather than having to wait until one came back to the office, decreased the risk of forgetting information. In this case, it was the material script (Akrich 1992[r]; Akrich & Latour 1992[r]), the mobility of the device, as well as the software itself that facilitated domestication.

Another important feature on handheld devices that was often mentioned by users was that it relieved them of the burden of carrying instructions and information in paper form:

> *'We were going to start using this and read the assignments on it… and… we used to have these paper lists. Really thick ones, like ten pages where everything we were supposed to do for care recipients was written, and I thought 'oh my god and now we have to learn this as well?' But now I love it, now I can't work without it! Nowadays, I can't stand the papers, I only carry this one where I've noted the order of visits'*

In this and other similar accounts, the technology's ability to enter into the network of practices (Latour 2005[r]; Sørensen et al. 2000[r]) is made dependent on how its mobility works together with the software's capacity to house much information in a 'small package' to relieve the homecare worker of the 'really thick' stacks of paper, rendering her work paperless. The homecare workers unanimously praised these two specific features. In these accounts, the handheld device is described as more than a technology. It has transformed into something beyond the technology itself (Haddon 2006[r]). It has become something with which one can have an emotional relationship. Using it has become a natural part of being a homecare worker, to the point where homecare workers feel it would not be possible to perform homecare work without it.

These descriptions of the handheld unit reveal how end-users could keep using it to fulfil desired results by translating (Latour 2005[r]) it to their own needs. This occurs implicitly by 'fidgeting' with the unit (i.e. to learn how its functions may be advantageous), and explicitly by using it as a time saving resource (i.e. when writing reports) and a source of knowledge (i.e. when using it as a replacement to the paper reports which they used to have to carry). Typically, when homecare workers account for how scripts contributed to the fulfilment of their needs and desires, they draw from personal instead of collective experiences. Without such personal revelations of how the technology fits with their needs and desires, the practical, symbolic, and cognitive adaptions that are necessary for domestication to embed the technology into the daily routines might be less likely to occur. More crucially, however, signs that of the technology had entered into networks of practices never occurred in relationship to the handheld device in its capacity of a VRP-solver.

The planner too, while using less affectionate terms, expressed an appreciation for the system when I questioned the value of the technology when she was not able to use it for calculating driving routes:

> **J.:** *But is the technology not essentially useless to you now? [after the capacity to calculate routes has been disabled]*
> **Planner:** *But it does help me, it helps me with all of the information on the clients and on the employees. Of course, doing it in this way takes a lot longer both for me and for the others [the homecare workers] but I would not say that it is completely useless.*

Even though the software does not function as a VRP-solver, the planner is still able to appreciate it. Her appreciation is due to its usefulness in storing all the relevant information needed to fulfil the task of making driving routes. In this case, the technology's ability to enter into networks of practices (Latour 2005[r]; Sørensen et al. 2000[r]) is facilitated by the software's capacity to store a great deal of information in one place and the possibility to draw on that information, such as how much time a specific visit is estimated to take when constructing schedules. It is this weak script (Latour 1991[r]) that allows the planner to disable this function. Effectively displacing (Latour 2005[r]) the VRP-solver component from the software by using a feature of the program itself, as opposed to having to construct an antiprogram. It is this weak script that enables her to use the software even without the VRP-solver component. Consequently, it is possible to observe that in this case, the weak script is constitutive of the faulty driving routes rendered through use of the PC based version of the VRP-solver. A second observation is that this domestication is somewhat ironically constitutive of the removal of the very aspect that makes it a VRP-solver i.e. the capacity to calculate optimal driving routes by drawing on geographical data. A removal which in turn, occasions the need for homecare workers to displace (Latour 2005[r]) the handheld VRP.

Similarly, in its capacity of a VRP-solver, the handheld device was treated as inconsequential. It was not mentioned in discussions between colleagues when routes were planned, nor touched during route planning activities. In fact, it was only referenced when I asked direct questions concerning its use, whereupon workers would typically dismiss it as something that had nothing to do with driving routes. While the homecare workers were not able to draw on a weak script (Latour 1992[r]) to re-engineer the handheld device. They were nevertheless able to re-engineer it by deploying an antiprogram (Latour 1991[r]) which effectively displaced it from operations related to driving routes. In relationship to the handheld device as well, at this point domestication has meant displacing (Latour 2005[r]) the handheld device.

In processes of domestication, the technology becomes part of users' everyday lives. This implies that end-users are pivotal to the design of new technologies (Berker 2011[r]). As the case of the handheld unit demonstrates, technologies may or may not alter existing routines depending on whether or not end-users have been able to make personal experiences of the technology as capable of fulfilling their needs. When end-users understand scripts as inconsequential or even hindering to necessary activities, the technology may lose the normative capacities envisaged by designers or implementers (Berker 2011[r]). However, when scripts align with end-users' interests, the technology's capacity to deliver predictable results may be less challenged.

Vehicle Route Problem Solver Displaced

This study has shown that the PC-based VRP-solver is rendered 'malfunctioning'. Through processes of domestication it becomes unable to provide homecare service workers with driving routes which they deem functional. Additionally, it has showed how this 'malfunction' renders the VRP-solver in its handheld form understood as inconsequential to the very decisions it was designed to support. Together, these processes of domestication result in the displacement of the VRP-solver from all practices related to driving route planning. For this reason, it is likely that a performance evaluation of the technology would find that the implementation of the VRP-solver fails to live up to expectations, such as the capacity to decrease travelling time by 20% as described in Eveborn et al. (2006[r]). In such a scenario, it is likely that decision-makers may question the quality of the product and seek alternate options.

Studies of technologies in domestic households have shown how the placement of a technology was found to be an important aspect of domestication. Where the TV was placed shaped its uses,

meanings, and functions (Sconce 2000[r]; Spigel 1992[r]). In the case of the VRP-solver, domestication has entailed its displacement from networks of activities where route planning is performed. As a result, end-users experience a need to geographically re-configure the driving routes. The displacement the handheld unit is partly dependent on the script in the handheld unit. This script presupposes that end-users are passive consumers of geographically optimal driving routes, as opposed to interested in and capable of constructing them. Antiprograms may involve displacing the VRP software from operations concerned with vehicle route problem solving. Implicitly, by issuing an instruction that, whether intentionally or unintentionally, prohibits planners from drawing on geographical data when making driving routes; or explicitly, by deploying an antiprogram which effectively renders the handheld unit inconsequential to homecare service workers' decisions in relationship to driving routes.

The script of the handheld device is also a question of presupposing certain patterns of presence and absence in planning activities. In the case of the handheld VRP-solver, this script is 'strong' there is not much scripted flexibility, and thus, not much mutuality in the adaption between users and the technology. Users' activities are restricted to adhering to the script or finding ways around it. As Jelsma (2003[r]) argues, scripts that allow or disallow user actions may also be understood as more or less normative in relationship to moral actions. As previously discussed, homecare work, much like any frontline human service work where street-level bureaucrats (Lipsky 1980[r]) provide services to dependent recipients a form of work that implies the application of some form of moral judgement (Hasenfeld 1983[r]; 1992[r]). Ultimately, these practices form the policy product which is ultimately delivered to the public (Lipsky 1980[r]). In this case, it is likely that the homecare workers practices of reordering the driving routes in order to achieve functionality, results in untimely visits to the care recipients.

In the case of the VRP-solver, the weak script that allows the planner to turn off geographical data may, somewhat ironically be understood as a strong script with a high dose of moral normativity that gains trickster qualities (Haraway 1991[r]) through processes of domestication after implementation. The planner is able to switch off geographical data, but she is unable to switch off the feature that lists the order of client. In other words, the script normatively privileges the timeliness of visits to care recipients over geographical rationality. Similarly, the scripting of the handheld unit prohibits homecare workers to interfere with the timeliness of visits by disallowing the digital reordering of visits. However, homecare workers have had to find ways to enable themselves to 'make it in time', they aim to achieve 'flow' by deploying an antiprogram that displaces the handheld unit from the social network, and thus by implication, also displaces the moral normativity of the script (Jelsma 2003[r]). In terms of domestication theory, we are reminded of how actors change as they enter into, move within, and transit out of networks, sometimes gaining trickster qualities in the process.

In the case of the 'malfunctioning' VRP-solver it is reasonable to assume that homecare workers activities of spending 30 minutes correcting the driving routes, and the very real possibility of untimely visits to care recipients, are both unintended implications or trickster qualities of these networks. In relationship to techno determinist understandings of the implementation of technologies as rational, linear and monocausal, the study of the VRP-solver is a case in point. Scripts do not determine users' behaviour.

In a study of Norway's domestication of the mobile phones, Sørensen and Nordli (2005[r]) found that perceived convenience led initially resistant users to be surprised at their need of their devices. This seems to be the case in relationship to the handheld device as well. Initial resistance is overcome by the notion that the technology greatly facilitates everyday practices. While new technological devices can be understood as separate entities, their entrance into everyday life means they not only enter into networks, but also that existing networks change and that technologies change with them. In the case of the handheld device in relationship to information on the care recipients, domestication has meant that the network has transformed in a specific manner. The 'piles of papers' that had to be carried around previously have exited the network, and so has the need to write reports on stationary PCs at the homecare service office.

The handheld unit was recognized as a facilitator of familiar and important practices, such as carrying around information on care recipients. Features perceived as useful by end-users were not only added to networks of actors, practices, and knowledge of transporting and carry and documenting information on care recipients; they also changed the network by displacing previous actors (i.e. papers and stationary computers) and changed aspects of everyday life (i.e. carrying papers, waiting time). By contrast, the single papers' ability to allow homecare service workers to reconfigure the order of visits to care recipients displaces the VRP component of the handheld unit from networks concerned with driving route planning. While delimitation of homecare workers control over workload in relationship to timeframe led to displacement. The same device manages not only to enrol homecare workers in a network, but also become an emotional object. In other words, it is loved in its capacity of facilitating the performance of homecare work. These findings strengthen the argument that the capacity of technologies to enter into networks of practices seems intricately tied to the ability of being perceived as supportive of end-users' interests and motives.

From a sociotechnical perspective, creative antiprograms deployed by end-users is not unexpected, and may be understood to serve as compensatory functions (Berker et al. 2006[r]). In this case the homecare workers understand the original configuration of the driving routes in their schedules as faulty to the point where they will not be able to perform all client visits within the timeframe available to them. It might be added that this is not a unique case. Their experience is supported by the findings of Holm

and Angelsen (2014[fi]), who found that driving time in the homecare services was routinely underestimated by at least 22 % when estimated by planners who were not able to draw on geographical data. Moreover, the homecare workers perceive handheld units to be useless in the venture of optimizing routes. In this scenario, it must be acknowledged that the homecare workers have the option of failing to perform their routes and simply go home at the end of the day, regardless of whether they have been able to visit all care recipients. Acting in this manner may even be a strategic choice in terms of rendering the problem visible to the larger society, as it is likely that a failing homecare service would put pressure on crucial decision-makers to disallow rough blanket time estimates. Instead, the homecare service workers make use of the antiprogram (Latour 1991[fi]) and draw on their tacit knowledge of the geographical area to construct routes that are as geographically optimal as possible under their circumstances. While this compensatory work solves the immediate problem on a day-to-day basis in part, it may also be understood as problematic in terms of addressing the larger issue as it serves to obscure how and why the VRP-solver 'malfunctions'.

The case of the 'malfunctioning' VRP-solver could be understood as the result of a misunderstanding of how the technology works. There can be no assumption that the instruction to exclude calculations of driving routes comes from a position of knowledge with regards to how the technology works. However, the technology includes features for turning the VRP-solving feature off in the planning interface, effectively setting the system to privilege blanket estimates over calculations. As I have previously argued there are also other indicators that such script may be commonly occurring. This might indicate that designers foresee situations where the software is bought but not used to its full capacity. It might also be observed that being seen to implement a technology which calculates 'true' distances while ensuring that using that software will never result in driving routes that exceed a predetermined time-frame might hold political value. Nevertheless, the same instruction also results in driving routes that are disruptive to the point that every homecare worker spends 30 minutes at the start of every shift to correct them. While this study has not been concerned with understanding the motives and understandings of managers regarding the use of the device(s), it is not unreasonable to assume that this problem-solving routine may be an unforeseen implication of the instruction to base all driving routes on a blanket estimate of 30 minutes.

Domestication studies teach us the importance of considering the relationships between technologies and users. The implications of technologies are hard to predict, perhaps particularly so in the case of complex technologies like ICT's. In its capacity of being a VRP-solver the handheld device becomes an obstacle that must be overcome. In such situations, it is the user's capacity to displace the VRP-solver that is perceived as necessary to perform homecare work. On the other hand, certain features of the technology are boasted as necessary if homecare work is to be performed at all.

In a time where technologies are increasingly implemented in welfare institutions, cases like this may serve as important reminders. Because user-technology relationships are sites where innovation occurs reliance on tests under controlled circumstances is not sufficient. Understanding the work technologies do, requires the careful study of how technologies interact with the everyday life of those meant to benefit from them.

Acknowledgements
The research presented in this article was funded by the Faculty of Humanities at the Norwegian University of Science and Technology. This article is part of the project Posthumanist Perspectives on Welfare Technologies in the Everyday Lives of Elderly Citizens led by Professor Merete Lie.

Conflict of Interests
The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

Akrich, M. (1992). The de-scription of technical objects. In Shaping Technology/Building Society (pp. 205–224). Cambridge. MIT Press.

Akrich, M. (1995). User Representations: Practices, methods and Sociology. In The Approach of Constructive Technology Assessment (pp. 167–184). London: Pinter.

Akrich, M., & Latour, B. (1992). A convenient vocabulary for the semiotics of human and nonhuman actors. In W. Bijker & J. Law (Eds.), Shaping Technology/Building Society Studies in Sociotechnological Change. Cambridge: MIT Press.

Angelsen R. (2013). Web GIS for homecare services (Web GIS for hjemmetjenesten) (Kart og Plan 2013 No. 3).

Astvik, W. (2000). Specialister eller generalister. Arbetsvillkor och Omsorgskvalitet i hemtjänst och boendestödsverksamhet (Specialists or generalists. Labour conditions and quality of care in homecare and domestic support practices). Arbete och Hälsa (Vol. 2). Stockholm.

Astvik, W. (2002). Svåra möten i omsorgsarbete (Difficult meetings in care work). Arbete och Hälsa 2000:17. Stockholm: Arbetslivsinstitutet.

Astvik, W. (2003). Relationer som Arbete. Förutsättningar för omsorgsfulla möten inom hemtjänsten (Relationships as Work. Conditions of Caring Meetings in Homecare Service). Stockholm: Arbetslivsinstitutet.

Baldacci, R., Mingozzi, A., & Roberti, R. (2012). Recent Exact Algorithms for Solving the Vehicle Routing Problem under Capacity and Time Window Contraints. European Journal of Operational Research, (218), 1–6.

Barer, B. M. (1992). The Relationship Between Older People and Their Homecare Workers, or the "Pas de Deux" of Homecare. Journal of Gerontological Social Work, 19(1).

Berker, T. (2011). Domesticating Spaces Sociotechnical Studies and the Built Environment. Space and Culture, 14(3), 259–268.

Berker, T., Hartmann, M., Punie, Y., & Ward, K. J. (Eds.). (2006). Domestication of media and technology. Glasgow: Open University Press.

Bertels, S., & Fahle, T. (2006). A Hybrid Setup for a Hybrid Scenario; Combining Heuristics for the Home Health Care Problem. Computers and Operations Research, 33(10), 2866–2890.

Bijker, W. E., Pinch, T. J., & Hughes, T. P. (Eds.). (1987). The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology. Cambridge: MIT Press.

Bryant, A., & Charmaz, K. (2010). The SAGE Handbook of Grounded Theory: Paperback Edition. SAGE Publications. Retrieved from https://books.google.com/books?id=OrgZjp9CoN8C&pgis=1

Charmaz, K. (2014). Constructing Grounded Theory. Retrieved from http://www.google.no/books?hl=sv&lr=&idv_GGAwAAQBAJ&pgis=1

Cheng, E., & Rich, J. (1998). A Home Health Care Routing and Scheduling Problem. Houston, Texas.

Dantzig, G., & Ramser, J. (1959). The Truck Dispatching Problem. Management Science, (6), 80–91.

Davies, K. (2001). Responsibility and Daily Life. Reflections over Timespace. In J. May & N. Thrift (Eds.), Timespace: Geographies of Temporality. London: Routledge.

De Laet, M., & Mol, A. (2000). The Zimbabwe bush pump mechanics of a fluid technology. Social Studies of Science, 30(2), 225–263.

Eliasson, R. (2000). Att sörja för äldre - hur ta tillvara kompetens inom äldreomsorgen? (Caring for elderly - how can competence in eldercare be cared for?). Àjour en serie kunskapsöversikter från svenska kommunförbundet. No 4. Svenska Kommunförbundet.

Eveborn, P., Flisberg, P., & Rönnqvist, M. (2006). Laps Care—an operational system for staff planning of homecare. European Journal of Operational Research, 171(3), 962–976.

Fahlström, G. (1999). Ytters i organisationen. Om Undersjuksköterskor, vård- och sjukvårdsbiträden i äldreomsorg (At the frontline. About care personnel in eldercare). University of Uppsala.

Haddon, L. (2006). Empirical Studies using the Domestication Framework. In Domestication of Media and Technology. Maidenhead: Open University Press.

Haraway, D. (1987). A manifesto for cyborgs: Science, technology, and socialist feminism in the 1980s. Australian Feminist Studies, 2(4), 1–42.

Haraway, D. (1991). Simians, Cyborgs and Women. The Reinvention of Nature. London: Free Association Books.

Hartmann, M. (2006). The Triple Articulation of ICT's. Media as Technological Objects, Symbolic Environments and Individual Texts. In Domestication of Media and Technology (pp. 80–103). Glasgow: Open University Press.

Hasenfeld, Y. (1983). Human Service Organization. Englewood Cliffs: Prentice Hall.

Hasenfeld, Y. (1992). The nature of human service organizations. In Y. Hasenfeld (Ed.), Human services as complex organizations. Newbury Park: Sage.

Holm, S. G., & Angelsen, R. O. (2014). A descriptive retrospective study of time consumption in homecare services: how do employees use their working time? BMC Health Services Research, 14(1).

James, N. (1992). Care=Organization+physical Labour+ Emotional Labour. Sociology of Health and Illness, 14(4), 488–509.

Jelsma, J. (2003). Innovating for Sustainability: Involving Users, Politics and Technology. The European Journal of Social Science Research, 16(2), 103–116.

Latour, B. (1988). Mixing Humans and Non-Humans Together: The Sociology of a Door-closer. Social Problems, 35(3), 298–310.

Latour, B. (1991). Technology is Society made Durable. In A Sociology of Monsters Essays on Power, Technology and Domination. London: Routledge.

Latour, B. (1992). Where are the Missing Masses? The Sociology of a few Mundane Artefacts. In W. E. Bijker & J. Law (Eds.), Shaping Technology/building Society Studies in sociotechnical Change. Cambridge, MA: The MIT Press.

Latour, B. (2005). Reassembling the Social. New York: Oxford University Press.

Law, J. (Ed.). (1991). A sociology of monsters: Essays on Power, Technology and Domination. London New York: Routledge.

Leppänen, V. (2005). Vårdtagaren som arbetsmiljöproblem. Kategorisering och hantering av besvärliga vårdtagare inom den öppna hemtjänsten. (The care recipient as a problematic element of labour conditions. Categorization and handling of problematic care recipients in home car. Malmö: Arbetslivsinstitutet Syd.

Levold, N., & Spilker, H. S. (Eds.). (2007). Kommunikasjonssamfunnet. Moral, Praksis og Digital Teknologi. Universitetsforlaget.

Lie, M., & Sørensen, K. H. (Eds.). (1996). Making Technology Our Own? Domesticating Technology into Everyday Life. Oslo: Scandinavian University Press.

Lipsky, M. (1980). Street-level Bureaucracy. New York: Sage.

Ministry of Health and Care Service. (2012). Future Care (Morgondagens Omsorg) Meld ST 29 (2012-2013) Report to the Storting (white paper). Oslo.

Mol, A., & Law, J. (1994). Regions, networks and fluids: anaemia and social topology. Social Studies of Science, 24(4), 641–671.

Nickel, S., Schröder, M., & Steeg, J. (2012). Mid-term and short-term planning support for home health care services. European Journal of Operational Research, 219(3), 574–587.

Petersson, H., Leppänen, V., & Jönsson, S. (2006). Villkor i arbete med människor – en antologi om human servicearbete. Stockholm: Arbetslivsintitutet.

Reichertz, J. (2007). Abduction. The Logic of Discovery of Grounded Theory. In A. Bryant & K. Charmaz (Eds.), The Sage Handbook of Grounded Theory (pp. 214–228). Sage.

Sconce, J. (2000). Haunted Media: Electronic Presence from Telegraphy to Television. Durham and London: Duke University

Press.

Silverstone, R., & Hirsch, E. (1992). Consuming Technologies: Media and Information in Domestic Spaces. London: Routledge.

Sørensen, K. . (2006). Domestication: The Enactment of Technology. In T. Berker, T. Maren Hartmann, Y. Punie, & K. Ward (Eds.), Domestication of Media and Technology (pp. 40–62). Glasgow: Open University Press.

Sørensen, K. ., Aune, M., & Hatling, M. (2000). Against linearity - on the cultural appropriation of science and technology. In M. Teoksessa Dierkes & C. Groete (Eds.), Between Understanding and Trust. The Public, Science and Technology. Amsterdam: Harwood.

Sørensen, K. ., & Nordli, H. (2005). Mobil moral og kjønn i endring? Mobiltelefonen i norske voksnes hverdagsliv. Kvinneforskning, (5), 57–73.

Spigel, L. (1992). INstalling the Television Set: Popular Discourses of Television and Domestic Space, 1948-1955. In L. Spigel & D. Mann (Eds.), Private screenings: Television and the female consumer (Vol. 2) (pp. 3–41). Minneapolis: University of Minnesota Press.

Szebehely, M. (1995). Vardagens organisering. Om vårdbiträden och gamla i hemtjänsten (The organization of everyday life. About care personnel and elderly in the homecare services). Lund: Arkiv Förlag.

Szebehely, M. (ed). (2005). Äldreomsorgsforskning i Norden: en kunskapsöversikt.

Toth, P., & Vigo, D. (Eds.). (2001). The Vehicle Routing Problem. Philadelphia: Society for Industrial and Applied Mathematics.

Trydegård, G.-B. (2012). Care Work in Changing welfare States: Nordic Care Workers' Experiences. European Journal of Ageing, 9, 119–129.

Ungerson, C. (1983). Why do Women Care? In J. Finch & D. Groves (Eds.), A Labour of Love; Women Work and Caring. London: Routledge.

Vabø, M. (2005). New Public Management i Nordisk eldreomsorg - Hva forskes det på? (New Public Management in Nordic Eldercare - what do researchers focus on?). Copenhagen.

Vabø, M. (2007). Organisering for velferd. Hjemme tjenesten i en styringsideaologisk brytningstid (Organizing welfare. Homecare Servcies in a time of steering-ideological reform). University of Oslo.

Vabø, M. (2009). Homecare in transition. The complex dynamic of competing drivers of change in Norway. Journal of Health Organization Management, 23(3), 346–359.

Wærness, K. (1984). The Rationality of Caring. Economic and Industrial Democracy, 5(2), 185–211.

NORDIC JOURNAL
of Science and Technology Studies

BOOK REVIEW

Emergent Ecologies

Eben Kirksey. Duke University Press, 2015

By Trine My Thygaard-Nielsen

In Emergent Ecologies Eben Kirksey takes the reader on a thought-provoking trip to emergent ecologies around the world. With theoretical concepts and methods from various disciplines across the sciences multiple species give their perspective. The result is an attention-grabbing, timely and well-written book with the noble goal of exemplifying and enhancing the positive hopes for future ecosystems in a time where apocalyptic presentations dominate.

Kirksey takes his point of departure in the field of conservation biology. Combined with contemporary philosophy and anthropology he sheds new light on how multispecies communities are shaped by chance encounters, historical accidents and parasitic invasions. With this base for the understanding of multispecies worlds Kirksey takes the reader on a journey through a complex entanglement of political agendas, commercialization strategies, scientific knowledge, local livelihoods, conservation projects and global funding all of which have been undergoing historical transformations. Throughout the journey Kirksey represents and threats the natural world as inhabited by multiple species in which species close down and open up opportunities for each other. Kirksey manages this ambitious task by adjusting how much attention he pays to each factor throughout the chapters. Both by empirical and theoretical example Kirksey masters the fine balance act between coherence and fragmentation by moving beyond conventional distinctions between humanities, natural and social sciences. Throughout the book he introduces a vast amount of concepts, a myriad of actors and ecosystems, and an impressive interdisciplinary data-set produced in places as different as ant colonies, bird whisperers, snake breeders, microbes and a conservation forest school. All of which he impressively succeeds to interweave into a coherent interdisciplinary book that lets the reader know why the different subjects are central when understanding the various ambitions and agendas at play in emergent ecologies.

The book consists of ten chapters in which theory and empirical merge elegantly making the book a fluent read. In the introduction Kirksey sets off with a twofold ambition: a) to punctuate the lonely "umwelt" (understood as phenomenological bubbles or one's world of perceptions and actions) of humans only in love with themselves (p. 84) and b) to move beyond the dialectic discussion of messianic and apocalyptic presentations of the future by focusing on the hopes for the future expressed by a multitude of actors working within and around conservation. In order to meet his ambitions both Kirksey's theoretical and methodological apparatuses are diverse stemming from the fields of biology, philosophy, sociology, and anthropology.

The biological concept "umwelt" is one of Kirksey's key concepts throughout the book. Through the study of chytrids' (microbes) "umwelt", under the guidance of Joyce Longcore, Kirksey learns to expand his own "umwelt" and thereby his understanding of emergent ecologies (p. 73). He makes this gift tangible for the reader both through the empirical chytrid example and through the discussion of the theoretical strives over the concept.

Despite the focus on multiple and diverse actors in various research sites most empirical examples engage in a dialogue with each other and Kirksey has empirically investigated every single subject, either on his own or in collaboration with other researchers. The approaches range from fieldwork, artistic installations, participant observation, and laboratory work. Even though they can seem fragmented, together they make up a convincing and necessary starting point wherefrom we can get closer to understanding emergent ecologies from multispecies' perspectives. Namely by enhancing our own "umwelt" as humans.

The study of chytrids not only brings along the foundation for widening our "umwelt" but is also linked to chapter four on frog conservation demonstrating that chytrids are important actors transported by frogs who again were transported by humans leading to the almost extinction of other frog species. This cleverly constructed interrelation between chapters not only further develops the concept of "umwelt" but also demonstrates how we as species (humans, chytrids, and frogs) are co-creating ecosystems although coincidental. Another strong example of co-created ecologies is the Palo Verde natural park in Costa Rica and its surrounding farmland. The natural park was cattle-farmland owned by American farmers who introduced jaragua grass to the local flora. After the farmers were stripped of their land part of it were turned into a natural park and parts were turned into parcels given to local farmers. Today local government is struggling to fight back jaragua grass and bring back local flora and fauna while local rice farmers are struggling to secure their crops from endangered species feeding on their fields. At the same time a local school is engaged in pragmatic conservation. This example presented in the last two chapters of the book makes up a description of an emergent ecology on its own complete with conservation strategies, intentions at a local school, local farming

struggles, "wild"-life, international donors and thereby the scene is set for various agendas that collide, die or meet in pragmatic solutions. E.g. As an attempt to exterminate and capitalise the dominating "non-native" cattails of the area international donors, donated money to start up a local artisanal cattail-paper-making cooperative. After the first order it turned out that cattails was a bad papermaking source and the initiative as well as the funding died out. Another more durable story is the flourishing forest school where volunteers and pre-schoolers rebuild a pragmatic forest with attention to local traditions, rare wildlife, and future climate change.

Together these central parts make up the bearing elements of the book and are backed by examples of other arisen ecologies that have caused species to mingle or going extinct in new ways as e.g. monkeys set loose in Florida to attract tourists or the African clawed frog that spread around the world as a pregnancy test. The insistence on the multi-sited is both the book's weakness and strength. Weakness because the important message of interconnectedness in some examples fades in the midst of diverse sites and many actors. Strength for the same reason, namely that Kirksey demonstrates how complex these ecological entanglements are and how coincidental connections can be made, including a frog invading ecosystems worldwide because it at a point in history was the best pregnancy test available. This frog is one of Kirksey's living examples of a co-creation on a global scale causing locally emergent ecologies across cityscapes, construction-sites, agriculture, natural parks and other types of ecosystems.

On a more critical note, although actors are copiously described, notions such as assemblages and ecologies used in a variety of constellations such as (unruly) assemblages, (emergent) ecologies lack the same sharp and copious description. Though all empirical examples ads each their perspective on multispecies worlds at times the connection between empirical example and the notion of emergent ecologies is lost. E.g. the chapter on multispecies families in which Kirksey demonstrates how endangered animals are "flexible persons" turned into loved ones and commodities through change of moral spheres (p. 135). Indeed a very important precarious situation however the link to hopes for future ecosystem is not straightforward.

Nevertheless, this does not take away the book's incredibly fascinating insights into how ecologies do not simply evaporate but are constantly emerging in ways humans cannot (un)plan. By placing all actors on an equal footing, both empirically and theoretically Kirksey succeeds in "taking seriously" (see Swanson 2015[55]) all sorts of things around him as ethnographic objects and valuable scholarly thinking. By doing so Kirksey demonstrates to us how we as human researchers have to expand our phenomenological bubble or "umwelt" to grasp the ways that plants and animals are equal participants in emergent ecologies. A lecture that is good to think with when considering social worlds as not created solely by humans but rather with and alongside other living species of which there are more than we might have imagined.

Therefore this book is of interest to any scholar, across the sciences, whose interest is in the (natural) world on the premise of multiple species' interaction and conservation strategies. Policymakers and conservationists too should read this book to get insights into how nature is the project of multiple species. All in all, Kirksey offers a groundbreaking approach to the natural world and by knitting together various examples from very diverse research sites and perspectives Kirksey offers hope to the future of ever emerging ecologies. A must read for scholars that seek to grasp the jammed intersections connecting the roads of various species, material technologies as well as national, local and international interests in a historical still frame affected by ideas from past times and hopes for future scenarios.

Reference and bio

Swanson, Heather 2015: Who's in the room?: The importance of multidisciplinary spaces for anthropology and STS. Part of: Anthropology and STS Generative interfaces, multiple locations. Hau: Journal of Ethnographic Theory 5 (1)

Trine My Thygaard-Nielsen holds a MA in Anthropology from Copenhagen University and is an anthropological assistant at the Interculturalism, Migration and Minorities Research Center, at KU Leuven. Her studies focus on the European supply chain of the Spanish tomato and the relation to nature in the era of the anthropocene.

thygaard@gmail.com

NORDIC JOURNAL
of Science and Technology Studies

ABOUT THE COVER ARTIST

HC Gilje

By Ivana Subotićki

HC Gilje is a Norwegian artist with formal training from the Academy of Fine Arts in Trondheim. His work has since taken him around the world, to different venues and collaboration, numerous theater and live video project. Some of this work has even been captured in two separate DVD releases - 242.pilots live in Bruxelles and Cityscapes.

Since 2006, he has focused on the concept Conversation with Spaces. Here he explores the relationships between light, sound, movement, and space. Using audiovisual technology, and developing his own Video Projection Tool (VPT), he investigates how light and sound create dialogues with physical spaces.

In Gilje's installations, the light source itself is not the most interesting, but rather, how the light interacts with the physical structures. Light is visible only when it is manifested in the materials through reflection, refraction and shadows. Through this approach, both the physical space and our experience of the space is transformed. His way of working with these elements can be seen as signifying the interconnectedness between technology and society. In turn, his installations can be interpreted as physical visualizations of this interplay.

Amongst his most recent installations are the crossing outside Zapolyarny (RU) and part of the Dark Ecology project, in transit X at the Signal Festival in Prague, and blink in Hamar.

'off-the-grid' is a light-motion installation exhibited at the Project room, Carl Berner metro station in Oslo, in 2015. In this space, HC Gilje suspended 29 grids of existing light fixtures 1 meter above the floor, while synchronized light pulses created a constant motion of light and shadow. His focus on transforming physical spaces through light-motion is here especially interesting in connection with a metro station and people on the move.

For more information about the artist and his work: hcgilje.com