Practice makes perfect?

Sustainable practices with ICT and daily travel

MIRIAM BÖRJESSON RIVERA

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Sustainable practices with ICT and daily travel

Author: Miriam Börjesson Rivera

KTH Royal Institute of Technology
School of Architecture and the Built Environment
Department of Sustainable Development, Environmental Science and Engineering
Division of environmental Strategies Research –fms
and Centre for Sustainable Communications

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Abstract

The thesis shows how practice theory can be applied in different ways when exploring how daily life can be supported to become more environmentally sustainable. Ultimately the thesis aims to contribute to new knowledge on how to design policies and interventions that aim at facilitating environmentally sustainable practices. This thesis argues that practice theory is useful in the field of sustainability research since it offers as point of departure a perspective on human everyday life which decentres focus from individual behaviour and instead looks at how social practices are constructed by integrating and combining material, bodily and mental elements.

The thesis discusses the following questions: i) How can the role of ICT in everyday life be conceptualized from a practice perspective?, ii) How can practice theory be used in order to describe and assess second order environmental effects? and iii) What are the key considerations from a practice perspective when designing social/physical interventions for sustainable mobility?

The papers in this thesis all use practice theory as point of departure but with different outcomes. Practice theory is thus used conceptually, methodologically and analytically. The main conclusions of the thesis are: Changes in practices due to ICT usage will inevitably have environmental impacts, both negative and positive, and for policy-makers it is imperative to take this into consideration when planning for the future and actively support and facilitate sustainable social practices. Looking at changes in practices due to new ICT usage can be one way to include second order effects in environmental assessments, in this way contributing to a discussion of potential environmental impacts from implementing a new product, application or service.

Interventions, such as a cargo bike pool or restrictive work travel policies, have the potential to change existing practices. However, the potential of these changes, depend on a variety of different factors which are more or less difficult to influence for the individual practitioner such as work location, time schedules, availability of transportation means and modes. Further, it is difficult to foresee exactly how such changes will look and if they sustain in the long run. Finally, it is not necessarily so that an intervention will have the desired outcome that was intended, the outcome might be something else, consequently this means that interventions need to be analysed and assessed from other perspectives, one being a practice perspective.

Keywords: Social practice theory, sustainable practices, ICT, mobility, second order effects, cargo bikes, mediated meetings

Sammanfattning

Denna avhandling visar hur praktikteori (practice theory) kan tillämpas på olika sätt när man ska utforska hur det dagliga livet kan bli mer miljömässigt hållbart. Ytterst syftar avhandlingen till att bidra till ny kunskap om hur man kan utforma strategier och åtgärder som syftar till att stödja miljömässigt hållbara praktiker. Denna avhandling hävdar att praktikteori är användbart inom hållbarhetsforskning eftersom den utgår från de vardagliga praktikerna. Detta ger ett perspektiv på människors vardagsliv som lyfter fokus upp från individens beteende och istället undersöker hur praktiker skapas och omskapas genom de element (material, färdigheter och symbolisk innebörd) som utgör en social praktik.

Avhandlingen behandlar följande frågor: i) Hur kan IKT: s roll i det dagliga livet begreppsliggöras?, ii) Hur kan praktikteori användas för att beskriva och andra ordningens miljöeffekter i miljöbedömningar? och iii) Vilka är de viktigaste överväganden utifrån ett praktikteoriperspektiv vid utformningen av sociala och/eller fysiska åtgärder för hållbar mobilitet?

Artiklarna i denna avhandling utgår från praktikteori, men det teoretiska ramverket används på ett konceptuellt, metodologiskt eller analytiskt vis i de olika artiklarna. De viktigaste slutsatserna i avhandlingen är: Förändringar i till följd av IKT-användning kommer oundvikligen ha miljöpåverkan som kan vara både negativ och positiv. För beslutsfattare är det viktigt att ta hänsyn till detta när man planerar för framtiden och aktivt stödja och underlätta för hållbara sociala praktiker. Miljöbedömningar behöver kunna hantera och inkludera så kallade effekter av andra ordningen för att kunna bedöma potentiell miljöpåverkan som en ny produkt, program eller en tjänst kan ha. Ett sätt att inkludera andra ordningens effekter i miljöbedömningar kan vara att titta på förändringar i vardagliga praktiker som uppstår vid användning av IKT.

Interventioner och andra typer av åtgärder har potential att förändra befintliga mobilitetspraktiker. Men dessa potentiella förändringar, beror på en rad olika faktorer som är mer eller mindre svårt att påverka för den enskilde utövaren så som arbetsplatsens lokalisering, scheman, tillgång till transportmedel och transportsätt. Vidare är det svårt att förutse exakt hur sådana förändringar kommer att se ut och om de håller i sig i det långa loppet. Slutligen är det inte nödvändigtvis så att en intervention eller annan åtgärd kommer att ha det önskade resultatet som avsågs, utan resultatet kan snarare vara något annat. Detta innebär att insatser och åtgärder måste analyseras och bedömas ur andra perspektiv, till exempel ett praktikteoretiskt perspektiv.

Förord

En gång i tiden hade jag siktet ställt på att ”klippa mig och skaffa ett riktigt jobb”. Jag hade efter musiklinjen på gymnasiet, läst lite strökurser i socialantropologi, portugisiska och hoppat av kulturvetarlinjen. Efter genomgånget naturbasår på Komvux sökte jag och kom in på KTH. Jag stod ut i sammanlagt 4 dagar, det här med nollning var inte min grej. Jag anade också, med all rätta, att min framtid inte låg i att plugga matte så här intensivt i drygt fyra års tid. Jag hade bestämt mig för att plugga det jag tyckte var roligt och inte det jag trodde skulle ge en trygg karriär. Åren gick, jag lyckades skrapa ihop en fil. kand. i socialantropologi och jag och min man, Linus, fick vårt första barn. Under föräldraledigheten bestämde jag mig för att söka in på det nya tvååriga internationella masterprogrammet i socialantropologi. Under denna utbildning lärde jag känna en rolig, snäll och hemskt smart australiensare, som faktiskt är anledningen att jag hamnade på KTH (igen).

Efter masterprogrammet började min gamla kursare att doktorera i människa-datorinteraktion och på våren 2011 ringer hon mig och frågar om jag är intresserad av ett extraknäck. De var korta om folk i en studie som skulle göras på ett forskningscenter dit hon var knuten och de behövde någon som kunde göra intervjuer. ”Ring, den här personen” sade hon. Sagt och gjort, jag ringde upp och blev timanställd på KTH för att göra intervjuer. Tack Rebekah Cupitt för att du kom att tänka på mig! Utan dig hade jag aldrig ens hamnat på den här banan och så roligt att vi också fick tillfälle att skriva ihop. Jag väntar med förväntan att få läsa din avhandling som snart kommer att vara klar! Efter att studien var klar fick jag frågan om jag ville göra något annat, hjälpa till att färdigställa ett manus till en tysk antologi om miljöetnologi. Jag tyckte det lät roligt, och på den vägen var det. I två års tid arbetade jag i olika projekt och så småningom fick jag frågan om jag ville lica, vilket jag naturligtvis ville! Och nu är den faktiskt klar, den där licen. Det är dock en massa människor som på olika sätt har bidragit till att denna licentiatavhandling blivit klar. Jag har haft ett helt gäng med fantastiska handledare; Mattias Höjer, Greger Henriksson, Jonas Åkerman och Josefin Wangel har guidat, stöttat, förmanat och läst det jag skrivit. Stort tack till er! Särskilt tack vill jag ge Greger som tyckte att jag kunde passa för den där första studien och sen fick in mig på en massa olika projekt. Du har alltid haft en stor tillit till att jag klarar av saker och vi har haft många roliga diskussioner om forskning, musik, barn och flanellografer som jag vet kommer att fortsätta.

Jag ska passa på att tacka Vinnova som finansierat de olika projekt såväl CESC-projekt som Innovativ Parkering, som jag haft nöjet att få jobba i. Tack också Annelise de Jong som interngranskade avhandlingen och vars kommentarer hjälpte mig väldigt mycket att utveckla texten och resonemangen. Jag vill tacka Elina Eriksson för att du varit en så bra projektkompis och för det nöje det varit att skriva ihop med dig. Det ska bli roligt att arbeta i det nya projektet tillsammans! Åsa Svenfelt, Cecilia Håkansson och Göran Finnveden, tack för det roliga arbetet i metodikprojektet som resulterat i bland annat (snart) två papper. Vem vet vi kanske kan arbeta ihop snart igen. Jag vill tacka alla på fms och på CESC, det är en så sjuk ynnest att få arbeta med så smarta, engagerade, roliga och snälla människor som er!

Jag vill också tacka min familj, min kära make, Linus och mina fina barn, Elsa och Sonia. Jag älskar er så mycket. Jag vill tacka mina föräldrar och mina syskon. Ett särskilt tack vill jag ge min systerson, Anton Larsson Rivera, som åtog sig att försöka tolka vad min avhandling handlar om i bild och vars verk nu pryder omslaget. Jag vill också tacka Maria Elena Bergman, ditt mentorskap har betytt mycket för mig ända från barnsben till vuxen ålder och du har också alltid uppmuntrat mina akademiska äventyr. Stort tack!

Slutligen vill jag ge ett särskilt tack till de boende i Brf Friheten och de anställda på TeliaSonera som så generöst bidrog med sin tid och kunskap och deltog i två av studierna vars resultat går att läsa i denna avhandling.

List of Papers Included in the Thesis

I. Börjesson Rivera, M., Eriksson, E., & Wangel, J. (2015). ”ICT practices in smart sustainable cities - In the intersection of technological solutions and practices of everyday life”. ACSR: 22, Proceedings of EnviroInfo and ICT for Sustainability 2015, pp. 317-324, Atlantis Press (conference proceedings).

II. Börjesson Rivera, M., Håkansson, C., Svenfelt, Å., Finnveden, G. (2014). "Including second order effects in environmental assessments of ICT". Environmental Modelling and Software (56) p.105-115.

III. Börjesson Rivera, M. and Henriksson, G. (2014) Cargo bike pool - a way to facilitate a car-free life? ISDRC 2014: Resilience - The New Research Frontier, Trondheim: Paper 4c4 in electronically published full papers (conference proceedings).

IV. Börjesson Rivera, M., Cupitt, R., & Henriksson, G. (2013). "Meetings, practice and beyond: Environmental sustainability in meeting practices at work". in Nachhaltigkeit in der Wirtschaftskommunikation. ed. Nielsen et al. (2013). Springer Fachmedien Wiesbaden. (book chapter).

Comments on my contribution to the papers

I.	I am responsible for this paper together with Elina Eriksson and Josefin Wangel. I was mainly responsible for the part on Social practice theory and contributed to the Introduction, the part on ICT practices, the Discussion and Concluding remarks.
II.	I wrote this paper together with Cecilia Håkansson, Åsa Svenfelt and Göran Finnveden. I was mainly responsible for the Introduction, A sociological perspective, Rematerialization and Induction, and Changed practices.
III.	I was the main author of this paper with Greger Henriksson contributing to the empirical study it is based on.
IV.	I am together with Rebekah Cupitt responsible for all parts of the paper. Greger Henriksson initiated the paper and contributed to the empirical material.

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1 Introduction

1.1 Background

The current lifestyles and consumption patterns in the industrialised countries are highly unsustainable and it is said that if the entire global population were to consume on an European level, three planets would be required to support the need of energy and materials (Tukker, Cohen et al. 2010). Lifestyles and consumption patterns are however, the outcomes of the social practices that people as members of society participate in (Warde 2005). In order to influence practices we need to understand how practices emerge and change and consequently how to design policies and infrastructure that support sustainable practices. Promoting pro-environmental behaviour through for example information is a thoroughly explored path but does not however give altogether satisfying results (Mont, Heiskanen et al. 2013, Shove 2014).

1.2 Aim and scope of the thesis

In this thesis I address and discuss sustainable social practices from three different perspectives; empirically, conceptually and methodologically. The aim of this thesis is to contribute with new knowledge on i) how people's everyday practices are affected by implemented measures; ii) how practices could be conceptualized theoretically; and iii) how practices can be explored methodologically. I use mainly examples from ICT usage and mobility. The aspiration is to provide a basis for how to design informed policies and other interventions that can facilitate sustainable everyday practices or at least help to mitigate some of the negative impacts of changing social practices.

The thesis addresses the following research questions:

- How can the role of ICT in everyday life be conceptualized from a practice perspective?
- How can practice theory be used in order to describe and assess second order environmental effects?
- What are the key considerations from a practice perspective when designing social/physical interventions for sustainable mobility?

The four papers included in this thesis result from four different projects. They thus differ in character. Two of the papers are conceptual papers that strive to define what an ICT practice is (Paper I) and to find a way to methodologically develop sustainability assessments to also include second order effects (Paper II). The other two papers can be described as case studies, looking into how residents (Paper III) and employees (Paper IV) experience and act upon different measures aiming at reducing environmental impacts of mobility. Papers I, II and IV have a focus on use of ICT in common.

1.3 Outline of thesis

This thesis consists of a cover essay and four appended papers. The cover essay starts by presenting the research context, Section 2, in which this thesis is positioned. Thereafter, in Section 3 and 4, the theoretical framework is described and discussed as well as how the methodologies of the papers were developed, including choice of methods. Following this the results are presented and analysed in Sections 5-7, and finally, in Section 8, the results are discussed in relation to each other and in relation to the aim and research questions of the thesis.

2 Research context

2.1 ICT and everyday practices

In this section I will present my perspective on how ICT usage is changing our everyday lives and the implications that has for energy demand issues. This also includes how ICT usage is partially decoupling everyday practices from former temporal and spatial locations leading to an increased complexity and fragmentation of the everyday timescape. I will indicate how the promise of ICT as potential sustainability catalyst is compromised by the way that ICT are part of practices performed in households and that the agency usually attributed to people is distributed in assemblages of practices that household members have been recruited into.

ICT is a very broad term that covers everything from data centres and telecommunication networks to end-user devices and services. Another term that is often seen is ICT solutions which according to Arushanyan (2014) "cover end-user devices, telecommunication networks, data centres and the services provided with the use of these products, being non-material by themselves but creating environmental impact due to content production, such as electronic newspaper, electronic magazine, e-book, electronic invoicing, teleconferencing, etc." (Arushanyan 2013:14). In this thesis I will however only focus on end-user devices and services and therefore telecommunication networks and data centres fall outside of the scope. I will be using the terms ICT, ICT devices, end-user devices and consumer electronics interchangeably, and when I do that, refer to ICT devices used by people in their everyday lives.

We are living in a time when ICTs are transforming everyday life, at quite an impressive pace. How things are currently done in contrast to the beginning of the millennia, provide a never-ending list of how ICT has crept into our daily doings. Listening to music, watching television, studying, planning trips and keeping in touch with loved ones are, to mention a few, areas where ICT has transformed the way we carry out our day to day life. The digital technology and its ever increasing user-friendliness has led to that we now are surrounded by ICTs and that ICT now is an indispensable part of what it means to be a normal functioning and participant citizen in modern society. This is true not only in the richer societies in the western world, but ICT has and is increasingly , albeit not as rapidly, changing the conditions of life in poorer parts of the world as well. One example is the way that mobile phones have revolutionized connectivity which has led to certain emerging and developing countries skipping landline and going straight to mobile technology (Pew Research Center 2014). Accessibility to the Internet is another one. The focus in this thesis is however ICT usage in the developed world where it can be considered a close to a prerequisite for private and work life nowadays.

In the GeSi Smarter 2020 report (GeSI 2012) the potential of ICTs role in reducing GHG emissions in sectors such as agriculture and land use, buildings, manufacturing, power, and consumer and service is explored. ICT is also emphasized as both optimization driver in transportation and as tool for substituting travel altogether. The report also stresses the lack of robust climate change policies on national and local level which is deemed as necessary to be able to unleash ICTs potential for sustainability. There are, however, no further examples provided of how such policies could be designed. The GeSi report also states that end-user devices have the largest footprint and stands for 59 % of total ICT GHG emissions (including GHG emissions from data centres and tele communication networks), and that this number is expected to increase (GeSI)(s.22). The GeSi Smarter 2020 report mentions behavioural changes as a barrier in some cases but fails to provide any deeper understanding on how behavioural changes could come about. Instead it leans on vague references to increasing awareness, that real time data could somehow

encourage behavioural change but also that consumers are unwilling to change ingrained behaviour. This view on behaviours and habits reveals a lack of understanding of how social practices function and co-evolve together with technological and infra-structural development to form new taken-for-granted ways of doing things.

The ongoing digitalization holds promises of lesser environmental impacts especially in reducing energy consumption but this is only part of the whole picture as ICT also causes environmental impacts in itself such as its production turnover e-waste (Umair, Björklund et al. 2013). This produces an uneasy tension between different perspectives of what sustainability might be. Christensen et al. (2007) point to that there is a lack of policy initiatives to mitigate the short lifecycles of ICT and that this most likely has its basis in how ICT has been framed as a building stone for the modern knowledge and information society. The few public campaigns addressing pro-environmental ICT usage has been to address the standby mode of ICT equipment and to encourage replacing old more energy consuming computer monitors for new ones that have lower energy demand (ibid.). The energy saving might however be outweighed by larger TV screens for example.

The use of ICT in everyday life is a recurrent theme in Papers I, II and IV. ICT is often promoted as a way to support more sustainable practices and as way to increase energy efficiency and help consumers to understand and act upon real-time information that can be provided by e.g. smart meters. What is less discussed is however what negative impacts the ICTs in our daily life add up to through the increased number of devices being produced, consumed and replaced and disposed of.

The ICTs of today are multipurpose in a way that they were not before and this gives that they are becoming more and more integrated into everyday practices (Christensen and Røpke 2010). For example smart phones and other mobile devices with internet connection can be used for a multitude of practices. This in itself also leads to higher energy demand and consumers substituting old electronics for new ones and thus contributing to more e-waste. Besides smart phones, tablet computers and laptops the number of other electronic devices such as, video game consoles, smart TVs, Wi-Fi networks, etc., is also increasing. Røpke et al. (2010) mean that the integration of consumer electronics in everyday life is now so prevalent that they can be said to represent the third wave of household electrification, due to the impacts this development has on the electricity consumption in homes. The two former rounds of electrification that have led to changes in practices and higher energy consumption are 1) indoor climate control through lighting and heating of homes and 2) electrification of cooking and cleanliness practices through the introduction of household appliances such as stove, fridge, washing machines, etc.

Strengers et al. (2014) note that energy demand policy and research often addresses an ideal consumer, 'Resource Man', which is seen as an adult that has agency to make rational decisions about his or her household energy consumption. What is overlooked, however, by focusing on ways to influence 'Resource Man', is how agency is distributed in assemblages of practices with actants, both human and non-human, which means that there is no 'Resource Man' making choices and decisions regarding energy consumption. Instead there are practices being performed by household members that have been recruited into specific energy-intensive practices that involve among other things ICTs. Strengers et al. conclude that policy makers should then set their sights not on the household members but on themselves, product designers, housing developers and the focus should be on ways to develop and disseminate low-energy ways of performing practices that can replace the more energy demanding ones.

2.2 Sustainable everyday travel in the city

Travel is an inevitable part of the everyday for the majority of urban dwellers. We travel to our workplaces, to go shopping, to go to meetings that are required by our workplaces, we travel for leisure and we travel to transport our children to their activities, to mention but a few travel motives. There is a need to make sure that the daily travel is done in a way that set environmental targets can be met. This becomes ever more acute considering the global trend of ongoing urbanization. As cities grow so do too the distances that people need to travel and impacts congestion for both cars and bicycles and crowded public transportation. In a work context (paper IV) the issue of travel is also an important one and companies are trying to find ways to decrease travel costs both for economic as well as environmental reasons.

The way that everyday travel practices evolve and are shaped has been explored and analysed by many. From a mobilities studies perspective Sheller and Urry (2006) state that transport researchers have black boxed the demand for transport and examined categories of travel as separate and self-contained rather than starting out in the "complex patterning of people's varied and changing social activities" (Sheller and Urry 2006:213). This leads to a failing to understand travel as a prerequisite for carrying out such activities and in extension social relations (ibid.). Travel habits are thus impacted by an array of factors such as location of residence, work, car ownership, access to public transport. Travel habits can change at certain moments in people's lives when something radically alters their living situation. According to Danish sociologist Mirjam Godskesen (2002) becoming a parent is one of those deciding moments in many households' travel practices due to the new time constraints, new tasks and the perceived demand of constant availability that are embedded in what it means to be a responsible 'good' parent. This new living situation pushes the households to re-organize the day-today transportation to be able to cope and in some cases buying a car is perceived as the best solution to coordinate the daily activities.

British sociologist Elizabeth Shove (2003) discusses how people's increasingly fragmentized time schedules together with increasing mobility options contribute to an increasing demand for co-presence which in turn drives a travel demand. The increasing travel demand and need for co-presence that constitutes 'normality' has particular implications for socially-spatially excluded people since they are unable to participate in the social practices that require co-presence and mobility. Shove defines the social-spatial inclusion/exclusion as: "an emergent property of the interaction between social practice and obligation, individual resources, and physical infrastructure."(Shove 2003:4).

Swedish sociologist Åsa Waldo (2002) discusses how the city's spatial structure together with transport systems impact the travel practices of people in regards to choice of mode and that time is decisive for type of transport mode for the majority regardless of their attitude and awareness of environmental impacts of travel. Waldo concludes that travel habits is something not reflected over in the households, implying that changing travel habits in a more sustainable direction requires other types of measures and not necessarily ones related to cost or environment. Ethnologist Greger Henriksson also discusses the way that choice of residential area and transport modes are integrated into the day to day life and how travel practices are self-reinforcing processes. Henriksson (2008) argues that policy instruments, such as congestion charges and parking fees, do serve their purposes and impact travel practices in a more sustainable direction. The important is to focus policy instrument to areas where people with resources live, work and shop since these are often the people whose consumption since these typically have a larger ecological footprint than people with less resources.

One way by which the usage of ICT devices is increasing and transforming everyday life is the way that we move and travel. More sustainable travel can be performed with and without the help of ICT. Walking and bicycling are obvious examples of the latter, but both walking and bicycling can be supported by ICT in the form of travel planners and online information about e.g. bike share schemes. Kramers (2014) discusses the role of multi-modal travel planners which also could present a non-travel option as a way to manage travel demand in a city. Nyblom (2014) however, has in her study of travel planning in everyday life come to the conclusions that even though travel planners indeed play a role in how people go about in planning the trips they are to make, they do not influence people's everyday trips. People seem to stick to familiar routes and modes rather than trying out new (less carbon-intensive) ones. This is especially the case when people have appointments. Travel information on the go functions, according to Nyblom, as a security blanket, providing the traveller with a sense of security during the trip, until the destination is reached. In a study on the use of travel information Farag and Lyons (2012) conclude that travel information is mainly used pre-trip by people that frequently travel by public transport, that are used to use travel information and who are positive to about public transport. Farag and Lyons argue that the role of travel information would increase if public transport was pursued more. However, they argue, as long as public transport is perceived as inferior to taking the car, neither use of public transport nor the use of travel information is likely to increase. The proliferation of smart phones might nevertheless lead to an increase of travel information on the go. A study (Bertel 2013) on the information and smart phone use among Danish youths states that the near-ubiquitous access to information available through smart phones has consequences for everyday habits of the youth. Through a process coined 'flexible alignment' that describes young people's ability to look up and adjust to new information in a rapid and flexible manner, demand for 'just-in-time' access to information could increase, in order to adjust to contingencies in everyday life.

From a work life horizon, travel matters as well. Commuting and working in geographically dispersed teams are two aspects of work travel. The opportunity to work from home, telecommuting is one way in which ICT is said to facilitate sustainability (Åkerman and Höjer 2006). Not everybody is, however, able to telecommute and not everybody is willing to do so. Within the field CSCW (Computer-Supported Collaborative work) the issues of working at a distance have been thoroughly studied and theorized showing that virtual teams have both advantages such as higher flexibility as well as challenges such as feelings of isolation (Olson and Olson 2000, Hertel, Geister et al. 2005).

3 Theoretical framework

3.1 Practices and habits

The practice turn within social science, philosophy and humanities has been described as a way to escape the dichotomy of structure versus agency by instead starting out with practices, 'what people do', as the fundamental social category (Stern 2003). From this turn a whole range of theoretical strands have emerged, one of them being social practice theory. Reckwitz (2002) states that practice theory differs from other cultural theories in that it locates the place of the social in the practice which is the smallest unit of social analysis. He defines a practice as a "routinized type of behaviour which consists of several elements, interconnected to one other: forms of bodily activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge." (Reckwitz 2002: 249). Reckwitz goes on

explaining how a practice forms a 'block' that depends on the specific interconnectedness of these elements, and which cannot be reduced to one of them. A practice being reproduced is rather a pattern which is filled out by a multitude of actions. A practice is dependent also on the carrier of practices, the individual, who also is the carrier of individually "routinized ways of understanding, knowing how and desiring."(ibid.). Schatzki describes a practice as "an open-ended set of actions linked by (a) pools of practical understanding, (b) arrays of explicit rules, and (c) a teleoaffective structure." (Schatzki 1997: 304). Schatzki further states that an action belongs to a given practice "when it expresses understandings, observes rules, and/or expresses one of the range of right and acceptable orders of life conditions that organize the practice."(Schatzki 1997: 304). Drawing on both Reckwitz and Schatzki, Shove et al. (2012) define a social practice as consisting of "elements that are integrated when practices are enacted"(Shove, Pantzar et al. 2012: 21), and that" practices emerge, persist and disappear as links between their defining elements are made and broken." (ibid.). The elements that a practice consists of are material(s), competence and meaning. Materials encompasses "objects, infrastructures, tools, hardware and the body itself" (Shove, Pantzar et al. 2012: 23), whereas 'Competence', involves the know-how, as well as "multiple forms of understanding and practical knowledgeability" (ibid.) The last element, 'Meaning', represents "the social and symbolic significance of participation at any one moment"(ibid.).

The concept of practices can be approached from two perspectives; practices-as-entities and practices-as-performances. The two perspectives on practices emphasize different aspects of what a practice is and how it can be analysed. Looking at practices as performances, on the one hand, emphasizes "the carrying out of practices, the performing of the doings and sayings" (Warde 2005: 134). Practices-as-performances are, furthermore, situated, locally, culturally and historically, which means that the elements will be integrated uniquely every time a practice is performed. Practitioners are thus the carriers of practices and a practice only exists when it is being enacted, performed.

Taking on the perspective practices-as-entities, on the other hand, focusses on how a certain practice has evolved over time, in what way it has sustained and recruited practitioners. Practices-as-entities presupposes that the practices exist "between and beyond specific moments of enactment. (…) [and are] carried, sustained and transformed by cohorts of practitioners […] Practices-as-entities would not exist without reproduction and reproduction depends on localised instances of performance." (Shove 2014: 418). However, by looking at practices-as-entities the focus is on the practice rather than the practitioner, and, consequently, on how practices recruit practitioners "who are willing and able to devote significant resources of time and energy to reproducing them over and over again" (ibid.). This particular approach is helpful when wanting to explore how changes in practices and behaviour happen. By stressing the integral elements that make up a social practice it is easier to see how a practice evolves and co-evolves along with the changes in technology, meaning and needed skill to be able to perform a certain practice. However, practices-as-performances might be easier to spot empirically, through observation and through interviews. I believe that the two perspectives do complement each other. By looking at practices as entities it is easier to analyse them from a socio-historical perspective and also discuss potential future trajectories of a specific practice depending on the integral elements. Looking at practices as performances gives way for a deeper and fuller understanding of what is going on at the moment that a practice is being performed. The two perspectives also lead to different methodological implications. In this thesis I have used both perspectives depending on what it is that has

been studied. I have not, however, made such a clear distinction between the two perspectives as is done here.

Habit is a concept which shares many characteristics with practice but that emphasizes the repetitive and routinized aspects of everyday activities. Campbell (Campbell 1996) defines a habit as: ”a learned act which has, through repetition, become automatic and hence easily and effortlessly carried out” (Campbell 1996) (s.159). This also implies that a habit is characterized by being to a large extent unreflected, which in turn stresses the limits of individual agency when it comes to habitual activities. Schwanen et al. (2012) on the other hand, suggest that habits can be seen as propulsive and generative tendencies rather than as behaviours. Moreover they state that the “habit is an emergent property of a bodymind-world assemblage – something that is fabricated out and ties together the fluid and continuously changing ensembles of limbs, muscles, sensory organs, the brain, neurochemical processes within the corporeal body, artefacts (including transport technologies), infrastructures, bodies of other human beings, rules, procedures, ideas, norms and other agents encountered as part of the flows and rhythms of everyday life.” (Schwanen, Banister et al. 2012: 526). This approach stresses the practitioner as nexus for the habit. Shove suggests that not all practices require a habitual reproduction and that habits can be seen as “practices that are recurrently and relatively consistently reproduced.” (Shove 2012: 101). Schwanen et al. however have a slightly different view and mean that practices are representations of habits and that habits are the forces implicated in routine performances, exemplified by commuting by car to work (Schwanen, Banister et al. 2012). Following these arguments it is perhaps fruitful to think of habits and everyday practices as interchangeable concepts. It is nevertheless also important to have in mind that the different concepts come from different theoretical backgrounds and thus have different methodological implications and applications from a policy perspective.

4 Methodology

In this thesis a variety of methods has been used. In this section I will describe and discuss the methods and methodological choices. The more empirical papers follow a methodology that reflects the before outlined theoretical framework whereas the more conceptual papers have a slightly different approach that nevertheless is firmly based in the same theoretical landscape. What the papers have in common is that they all are results of qualitative research. The aim of this thesis and the research questions posed invite to do qualitative studies, since the focus has not been to measure something or test a hypothesis but rather to try to explore and understand phenomena. Qualitative research aims at answering questions of the type ‘why’ or ‘how come’ rather than ‘how much’. The data you get is rich and ‘thick’ and the analysis process is an iterative one where findings can lead to changing the course of the study.

Another aspect of qualitative research that differs from quantitative is the way that the empirical material is constructed and analysed. Whereas it in quantitative studies perhaps is more of a sequential process there is in qualitative studies an ongoing conversation between the empirical material and how one chooses to process it in the analysis. Hammersley and Atkinson (2007) refer to data as ”materials to think with”(p.158). In qualitative studies the purpose is thus usually not to try a hypothesis but to find out other things, perhaps even something that you did not know you were looking for.

4.1 Exploring and analysing social practices empirically

How does one explore and analyse the ubiquitous and unreflected social practices that make the everyday? How does one get hold of the unnoticeable? Ethnographic studies can be one way to go about when exploring the mundane and everyday life and as a trained anthropologist this research methodology is the closest one to heart. Traditional ethnographic fieldwork that includes going to a specific field site and doing participant observation is however a time-consuming endeavour and there can also be difficulties settling on a specific field when studying contemporary everyday phenomena in one's own society. There are other ways of doing ethnography which do not require extensive periods of time in the field. Pink and Morgan (2013) for example discuss 'short-term ethnography' as a "route to producing alternative ways of knowing about and with people and the environments of which they are part" (Pink and Morgan 2013: 359). According to Pink and Morgan in short-term ethnography "the ethnographer seeks to implicate her or himself at the center of the action, right from the start, and engages participants in the project with this intention clearly stated."(Pink and Morgan 2013: 355). This also includes visual data gathering as well as observing participants doing everyday tasks. However, in neither of the papers included in this thesis, ethnography, whether short-term or longer, has been the basis for the data that form the basis of the analysis. The main methods used have instead been in-depth interviews and travel diaries in Papers III and IV and conceptual development in Papers I and II.

To empirically explore everyday travel practices a combination of travel diaries and in-depth interviews has proven quite fruitful. By combining the two methods the aim was to help the informants to reflect upon their social practices regarding transportation and work meetings.

Travel diary as a method originates in transport research and is usually used as a quantitative method in larger travel surveys. The use of travel diaries in Papers III and IV differs from the more traditional use, however. The focus of the travel diaries in Papers III and IV has been not to analyse the travel diaries per se but rather to be used as a starting point for reflecting upon travel practices in the in-depth interviews. In this way the travel diaries can be said to have functioned as cultural probes which in turn are "collections of evocative tasks meant to elicit inspirational responses from people – not comprehensive information about them, but fragmentary clues about their lives and thoughts." (Gaver, Boucher et al. 2004: 53). The travel diaries were handed out before the interviews to the informants and they were asked to fill it out on a day of their choice. Just one day was required to be filled out to get a glimpse into how the informant travelled on a specific day. The purpose of the travel diary was thus not to get aggregate data to analyse. In the following interviews the informants were then asked if they thought that this day was representative of their everyday travel and meeting practices and in what ways they were not. The travel diary can thus say to function as a way to validate what the informant says in the interview about regular travel patterns. This way of conducting an interview, albeit, anthropologically informed, can also be described as phenomenographic, which was how the analytical approach in Paper IV was labelled. Phenomenography is an approach used mostly in educational research and "aims at description, analysis, and understanding of experiences; that is, research which is directed towards experiential description" (Marton 1981: 180). Phenomenography differs from ethnography on a couple of points; Richardson (1999) points out that "ethnography implies the analysis of social processes by involvement in day-today experience" (Richardson 1999: 58) whereas phenomenographic researchers do not do participant observation of the particular educational processes they inquire (ibid.). Another difference is that in phenomenographic studies the researchers "do not adopt a sceptical attitude towards the statements that are made by their interviewees" (ibid.). In

ethnographic research, on the other hand, method triangulation is a way to check the validity of the data. According to Hammersley and Atkinson (2007) this is "an attempt to relate different sorts of data in such a way as to counteract various possible threats to the validity of the analysis" (Hammersley and Atkinson 2007: 184). It is thus important to not take data at face value (ibid.). In both Papers III and IV the combination of travel diaries and interviews has provided a means to triangulate the data that lay as basis for the analysis.

4.2 Conceptual development

Two of the papers in this thesis (Papers I and II) are more conceptual and because of this they cannot be portrayed as empirical. These two papers are partly founded on literature reviews as well as in discussions and in one case also an exploratory workshop. In Paper II the main purpose of the literature review was to find out how second order effects were named and described within in our respective disciplines/ research fields. The literature reviews also helped to establish that because of the rapid development in ICT technology there is a time lag in published papers that concern themselves with potential second order effects of ICT usage in an operational way. The literature reviews also made it clear that the second order effects are described under different names and consequently depending on the theoretical perspective different second order effects will

In Paper I we decided that we needed to develop a concept to help to counteract the techno-biased discourse that is prevailing in the smart cities literature. The method could thus be defined as based on a deductive approach (Höjer and Wangel 2015) that followed from our initial need of a concept. The concept that was coined ICT practices was then developed, discussed and elaborated.

4.3 Methodological reflection

Regarding Paper I it could be said that developing a concept that can be interpreted as widely as 'ICT practice' can be, might be counterproductive. That said I believe that the concept does have an important function as a catalyst for changing focus of how a problem should be defined. By starting out in the actual everyday practices of people and having as point of departure the common denominator, in this case ICT, and move upwards from this there might be a way to reformulate problems posed in a smart sustainable cities discourse and consequently discuss possible solutions that are grounded in the energy demanding everyday practices of citizens.

In the case of Paper II the indirect effects that were listed and discussed were done so in a hypothetical case of e-commerce. In hindsight it might have eased our endeavour had we chosen a case not as wide and diversely understood as e-commerce. On the other hand, by choosing e-commerce the chances that we could find a whole array of indirect effects described in the literature improved and this in turn also led to the paper being able to have a more general perspective on how ICT impacts a sector in intended and unintended ways.

The methods chosen in Paper III were basically the same as in Paper IV. This in turn has both advantages as well as drawbacks. Using same methods gives the two case studies certain coherence and offers a possibility to compare the different measures and their impacts on travel and meeting practices. On the other hand it is difficult to draw general conclusions on two such different cases as they have to be analysed in their own context, even though the informants might have certain common traits (i.e. living in greater Stockholm). Another issue is that even if the methods on paper might be similar the execution of the study will be a unique process. A third consideration is the recruitment of informants. In a way the researcher is always dependent on the kindness of strangers

to paraphrase the famous line from A Streetcar Named Desire, but it is also true that in the two cases in Papers III and IV gate keepers had a role in the recruitment although to a different extent. A gatekeeper is an actor "with control over key sources and avenues of opportunity" (Hammersley and Atkinson 2007: 27). As both Papers III and IV were outcomes of projects done in partnerships access to both fields were depending on help from gatekeepers. In the case of Paper III the recruitment of the housing association was done internally by a project partner, a large national co-operative who builds, manages properties and offers residential services. After the initial contacts with the volunteering housing association had been established informants could be recruited both through door to door knocking as well as through a meeting were the project was presented to the residents. The field in Paper IV was a company and as such access was limited even though the company itself was a project partner. The informants were recruited through the gatekeeper's personal network; however certain criteria informed the gatekeeper's choices.

In the case of Paper IV it could possibly have added to the understanding of the meeting practices to have spent some time at TeliaSonera and observing the way that the employees had their meetings, but at the same time I believe that by combining a travel diary with the interview we managed to explore that gap between discourse and practices which otherwise could have been filled with observations.

One interesting question that remains is whether or not the major investment in equipment for video meetings that was done shortly after our study was concluded has altered the meeting practices among the employees. This is, however, perhaps rather a question for future research than a methodological issue.

5 How can the role of ICT in everyday life be conceptualized from a practice perspective?

In order to analyse and discuss the role of ICT in everyday life which has crept into almost every aspect of it we argue in paper I that ICT needs to be made visible. To do so we propose the concept ICT practices. Why then ICT practices and not social practices? Is there really a need for research using the concept ICT practices or is it superfluous? In Paper I we mean that by using the concept ICT practices the *materiality* that ICT as needed element in order to perform a social practice is highlighted in a way that we think is a useful dimension to add to the ongoing discourse on 'smart' cities (see paragraph below). It is true that most social practices nowadays contain an element of ICT whether this is based, supported or enhancing the practice. This development has led to a situation where ICT now is taken for granted and therefore not really questioned or even seen. As ICT is continually promoted as a possible solution to sustainability problems there is a need to actively address all sides of ICT, which means also the more negative aspects of the ever increasing use of ICT. It also includes to actively recognizing that ICT as all technologies is value-laden which in turn has implications for how ICT is being adopted and used. By using ICT practices as a conceptual starting-point for analysis, both the technological and the socio-cultural components of the smart sustainable city discourse can be elicited and thus enabling a more explicit analysis of what assumptions this discourse rests on.

Smart cities and smart sustainable cities are fields on the rise and much of what is written about them revolves around highly techno-biased understandings of smart solutions. By techno-biased in Paper I we mean that they to a large extent fail to include the larger socio-material, political and economic structure in which ICT is (thought to be) situated in. This gives a rather atomized perspective on ICT solutions and smart solutions which views, perhaps unintendedly, the urban dwellers and their everyday life as something that needs to be 'fixed'. The latter is certainly evident in policy or policy-directed documents on smart cities where citizens as described the key beneficiaries of ICT investments. However, in these document citizens as beneficiaries are mainly assigned a role as passive receivers of benefits. This points to a problematic notion of ICT solutions as it only highlights deliberate use of ICT to address a problem, and not the way ICT have become a fundamental part of everyday life.

In Paper I we instead propose a practice-oriented perspective in order to explore the potential of ICT to contribute to sustainability. We define the concept ICT practices because we seek to highlight the role ICT plays in constituting different practices following how Shove and Walker (2014) have argued the need to make energy use visible and thus recognize energy as an element of social practice. By starting out in practices we offer a counterweight to an un-problematizing and techno-biased view on ICT and to link the technological perspective with the everyday practices in urban settings.

To define what an ICT practice is we start out by asking what kind of role or influence ICT should have in a practice in order for it to count as an ICT practice. As already stated ICT is now an integral element in most practices hence we argue that there is no clear demarcation. The prerequisites for what can be viewed as an ICT practices can be viewed as a continuum. This gives that what encompasses as an ICT practice can range from a practice that:

1. *cannot be performed without ICT* (such as playing video games or sharing pictures instantly and globally as with the online picture and video sharing service Instagram)

2. is ICT supported (such as paying bills, booking tickets, ride-sharing or using municipal e- services)

3. is ICT enhanced (such as using mobile applications for exercising or watching YouTube-tutorials to learn how to knit)

All of the mentioned examples include ICT as a material element: an artefact that mediates the activity. The inclusion of ICT as an integral element in the practice thus becomes the demarcation of what can be considered an ICT practice. The purpose of placing ICT practices on a continuum helps both capturing 'pure' ICT practices but first and foremost helps to illustrate the way ICT has become integrated into our everyday lives.

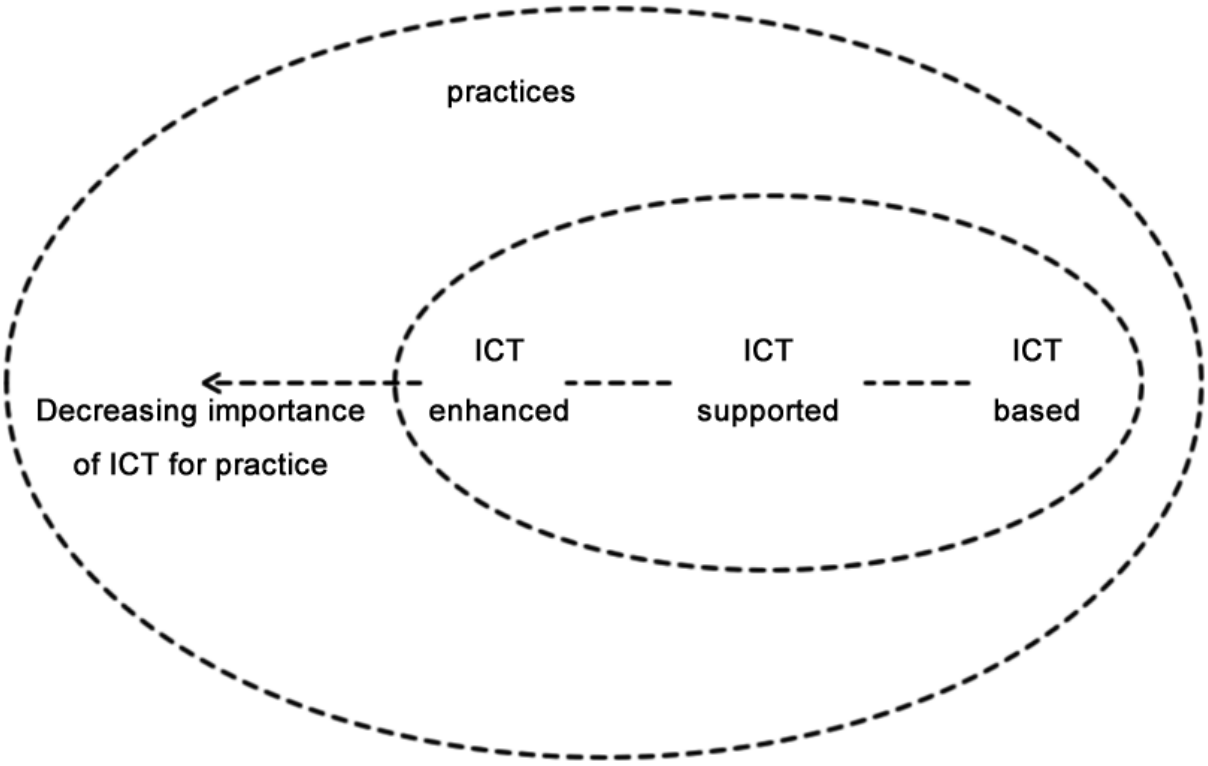

Figure 1. ICT practices understood as a continuum where the direction of the arrow shows a decreasing importance of ICT for the practice.

Further, when developing a definition of ICT practices we were inspired by systems thinking and specifically Churchman's action-oriented approach to delimiting a system from its surrounding. The reason for this is that we wanted to take the issue of agency into consideration. We hence pose the following questions to:

1. Does it (a specific ICT) matter to my objectives of the practice?

If not, then it cannot be considered as an ICT practice.

2. Can the performers of a practice (at least in theory) do anything about it (the specific ICT)?

If not, then it cannot be considered an ICT practice. One example could be automated control of ventilation without any possibility for interaction. However automated control of ventilation could of course be seen as part of social practice in the sense that the

shared notions of what is considered to be an ideal indoor temperature have evolved over time together with technologies to achieve it. Taken together this means that it is the meaningful use of ICT that is needed to constitute an ICT practice which gives to the definition:

An ICT practice is a recurrent situated action where ICT is experienced as a meaningful material element for performing that action.

The word meaningful in this context represents the element of meaning that is "the social and symbolic significance of participation at any one moment"(Shove, Pantzar et al. 2012). Meaningful thus represents the images and meanings that a particular ICT is associated with and that can be shared among practitioners. . This definition reflects the importance of ICT as a meaningful artefact as element of the ICT practice which we mean is what makes a specific practice an ICT practice.

We argue that by using social practice theory in exploring the concept of ICT practices, we open up for addressing issues around skills/competence and meaning in practices with ICT, which can have profound effect on the understanding of processes of change. The abovementioned definition of what could constitute an ICT practice is not only to be used in order to define whether a practice could be seen as an ICT practice or not but could also play an important role in understanding how, and in what way already existing practices can be changed. A social practice theoretical lens implies that for an ICT to become part of a practice it needs to be related to existing or created images with attractive connotations, but also to a set of skills needed to perform the practice (with ICT). In some communities of practice these skills are already in place, in others they need to be developed (cf. the digital divide). The definition and the social practice theoretical lens could also play an important role in understanding how existing ICT practices be made more sustainable, hence providing an entry point to understanding what role ICT can play in the transition to more sustainable cities. ICT does hold potential for making cities more resource efficient but for this potential to be realized rebound-effects resulting from increased volumes of ICT consumption and household electrification must be abated. Energy is a finite and precious resource, especially if considering the need to replace fossil fuels with renewable sources of energy. Thus decreasing energy use is a prerequisite to achieve climate targets. To do so, ICT4S research and social practice research have an important task to fill, together with ICT companies, urban planners and other stakeholders engaged in planning and developing our cities.

6 How can practice theory be used in order to describe and assess second order environmental effects?

In sustainability assessments of products and services the focus has been on making assessments of the direct environmental impacts said product or service has. This is the case in Life Cycle Assessments (LCA) for example. The direct impacts that a product or service has are the ones that can be directly connected to the production, use and disposal, these can also be called first order effects. However, there are a number of impacts and effects a product and service might have that cannot be assessed directly and that can have other long-term and far-reaching systemic effects. In the literature these have been termed indirect effects, ripple effects or rebound effects, depending on the disciplinary context. What these different impacts have in common is that they are the outcome of the introduction of a new product or service and since it is difficult to know and quantitatively assess what impacts a new product or service might have they have usually not been addressed. It is however important to consider and assess them in order to exploit the sustainability potential of ICT beyond simplifications as substitution and de-materialization.

ICT products and services can thus have a number of second order effects besides the direct and substitution effects, which can have significant environmental impacts. These second order environmental impacts of ICT products and services need to be considered in decision-making at different levels of society, including that by policy-makers, producers and researchers. The second order effects can both increase and decrease the environmental impacts, depending on the specific example.

The aim of Paper II was to review, describe and exemplify different kinds of second order environmental effects found in the literature. E-commerce was chosen as an example because it encompasses many of the potential benefits with ICT: virtualisation of products; digitalisation of information; dematerialisation of transport; diminishing of warehouse/office space; and shortening of supply chains. The review and conclusions however apply to ICT in general. The methodology was interdisciplinary and the authors had competences within different disciplines among others sociology/social anthropology. This approach was chosen because different effects and environmental impacts can be revealed using different methods in several disciplines. This was also one of the main findings in Paper II. Most environmental effects described in the papers reviewed here are differently interpreted in each discipline, which means that there are overlaps between categories and that authors from different disciplines have differing connotations of the terms. This gives methodological implications since researchers in different scientific contexts can pose different research question and have different purposes of the environmental assessment. But also gives that different disciplinary approaches and methods can produce different, possibly overlapping, answers that consider different aspects of the practice/service/product.

Looking at second order effects from a practice theory perspective means that you start out in the ways that ICT is being used by people in their everyday lives. A sociological perspective offers an empirically grounded holistic approach that can take account of different aspects creating the current situation, such as the historical, infrastructural, societal, economic and technological aspects. It is important to stress this, since many of these aspects tend to be taken for granted when trying to understand how change comes about. Wilhite (2008) argues that the view on how new technologies affect practices has been oversimplified and suggests that the technologies have intrinsic latent uses never imagined by the buyer. These latent uses, together with the changing socio-cultural contexts of everyday life, form a place where change in practice can occur. The increasing

consumption and use of ICT, referred to by Røpke et al. (2010) as the third round of household electrification, can be viewed in this way.

One of the second order effects identified was *changed practices* due to the ongoing integration of ICT in the everyday lives of people. By applying a practice perspective when studying the construction of a new normality more detail and subtlety can be added to the analysis and it also "provides a better basis for assessing long-term perspectives related to changing consumption patterns." (Christensen and Røpke 2010: 252). Even though there is overlap when looking at different practices, "the focus on specific practices highlights in more detail the dynamic co-evolution between technological, social and discursive changes" (ibid.) ICT are shaping and transforming everyday practices, such as shopping and handling virtual possessions, and by doing field studies or ethnographic studies the changing practices can be described and analysed with practice theory. Christensen and Røpke state that the Internet has" brought shopping into the frame of the home" (2010:252) and use of the Internet has become integrated into the practice of shopping alongside reading of brochures, visiting shops and discussing products with friends. Ren and Kwan (2009) come to the conclusion that people who shop more overall are also inclined to become e-shoppers comparing to people who shop less. Other influencing factors are access to internet connection and experience of using the Internet. The most important factors are nevertheless existing shopping practices and internet/computer knowledge. Farag et al. (2007) state that shopping practices in store and online tend to complement each other or even generate one another. They conclude that substitution and generation can occur simultaneously and recommend looking "beyond the traditional 'substitution or generation' issue and recognise the more complex relationships between e-shopping and in-store shopping" since shopping decisions depend on product, price and motivation.

The fact that more artefacts are becoming immaterial due to digitalisation leads to that it is necessary to explore and analyse how people interact and value their virtual possessions. The need to store and access virtual possessions in a study on teenagers manifested itself through the way that they stored things more or less temporary on their devices rather than physically on hard drives etc. the practice of storing things 'in the cloud' also meant that the participants of the study did not perceive a need for devices with great storage capacity (Odom, Zimmerman et al. 2011). By looking at social practices, a fuller picture emerges which provides a standpoint from where environmental impacts can be assessed. A social practices perspective could also be combined with scenario methodology in order to address second order effects. For example, different possible future shopping practices can be sought and used in scenarios to assess their potential impacts.

By presenting an approach to categorise indirect impacts, Paper II helps simplify the complexity involved in the categorisation and assessment of environmental impacts. Based on the literature review, it is evident that there is a need to standardise the terms used within different research areas and disciplines. A variety of terms are currently in use, so not only are the same environmental impacts labelled with different terms, but there are also examples of impacts that are labelled with the same term but mean different impacts. Future research should study how the terms overlap on a temporal, spatial and institutional scale, and where there might be gaps. Through mapping impacts and overlaps, methodological implications can also be explored.

Our main point is thus that if one is to make an environmental assessment that also includes assessment of second order effects, one is also making a theoretical, and by extension methodological, choice. Consequently, it is important to discuss any indirect

effects that are not being included in the environmental assessment even though it is perhaps impossible to include all possible indirect effects in an environmental assessment, but we believe that if environmental assessment is to be included as a basis for making informed decisions, it is necessary to develop methods that can assess indirect effects more systematically, or at least discuss the issues omitted. The interpretation of results from simplified environmental assessments cannot encompass all the complex impacts that can arise. Even if it is difficult to encompass and assess them all, and some are not even known, it is important to make it more transparent that some impacts are not assessed and strive towards mapping those not included. An important next step of this research will be to develop and apply methods that include these effects in environmental impact assessments regarding introduction of more resource-efficient ICT technologies. Clear transparency about the uncertainties involved in such assessments will make it easier for stakeholders to hold more constructive discussions on environmental impacts and decide on actions to be implemented in order to mitigate undesired side-effects of introducing more resource-efficient technologies.

7 What are the key considerations from a practice theory perspective when designing social/physical interventions for sustainable mobility?

A practice theory perspective can be of use when analysing and designing social and /or physical interventions aiming at changing people's behaviour and practices. In this section I will discuss the outcomes of two case studies that are examples of transport related interventions. In Paper III the intervention was the placing of a cargo bike pool in a housing association in Stockholm. In Paper IV is described how employees at a large telecom company experienced a drastic policy change regarding travel for meetings. I will start by outlining the cargo bike pool setting and summarising the main findings and then continue with presenting Paper IV.

We studied a trial of providing access to a cargo bike pool in a housing association. This was part of a project on climate smart cities which focussed on demonstrating and evaluating new solutions for parking and mobility in order to create attractive residential and urban environments while lowering costs for housing construction. When planning for sustainable cities, there is a need to take into consideration alternative transportation modes and further the use of these, for the types of trips that people tend to use cars for. One way to mitigate car dependency in everyday life could be by using a cargo bike for these types of trips. The purpose of Paper III was to map in what ways a specific trial of providing access to a cargo bike pool in a housing association affected both people's travel habits and how they reimagined the types of trips that could be done at all or done in another way in order to find car-free travel and transportation modes. In the paper we focussed on the residents who actually used the cargo bikes. By focussing on the just the users and not taking into consideration the non-users some findings are excluded which can inform the findings thus they will be added in this section.

The cargo bike pool was only used frequently (booked on 10 occasions or more during April-November 2013) by a small fraction of the residents. In total the cargo bikes were booked by 20 % of the residents on at least one occasion during the trial.

From a practice perspective the results of the booking help formulate some questions:

1. How does a practice get established?

2. How does a practice recruit practitioners?

When the trial was planned the housing association board suggested that the booking system be built on the laundry room booking routines. Another suggestion from the board was to have the same key used to open the front doors of the building, as well as the laundry room, for the locks on the bikes. The booking practices and using the same key can be seen as examples of how certain elements of a new practice, such as material elements and skills, are based on already existing practices. In this is a sense of continuity and familiarity in the element of meaning which helps establishing the cargo bikes as being for all residents in the housing association, in the same way as the laundry room is. It can also be seen as strategies for keeping the threshold down for a new practice and illustrate how new practices seldom are entirely new, but rather are built upon and integrated into already existing ones.

The practice of riding a cargo bike also included a variety of different elements and some new. Apart from cycling in itself riding a cargo bike as a practice comes with a series of new 'sub-practices', who that need to be getting accustomed to, such as booking the bike, how to lock it, how to park it, how to use the electric battery, remembering to cover the cargo box, etc. Other new practices are linked to the element of meaning, that is images

connected with the practice of cargo biking. The cargo-bikes opened up for were new types of outings and errands. When all the elements that constitute a new practice are in place the practice can become habitual and carried more or less unreflective and routinely. Only a small percentage of the residents came as far as adopting cargo biking this way and the reasons for this may be found both in why some residents chose to ride the bikes and why some did not.

The largest number of residents do however fall in the category non-users and even though their reasons for this vary they help to understand why an intervention might not give the expected results that were intended. Most studies tend to focus on users or potential for usage which is understandable as success stories are more fun than stories of failure.

The non-users we talked to thought the cargo bike pool was a great initiative but did not see any need to use a cargo bike for transportation themselves, as they already had adjusted their lives accordingly to their everyday practices. Some of the non-users that we interviewed had thoroughly considered the location of home in relation to public transport before moving to their current place of residence. They also felt that borrowing or renting a car was more than enough to solve potential transportation needs. One resident even suggested that adding regular bikes to the cargo bike pool could be a good way to develop the concept if he were to become involved. Another non-user stated that the bike she already had and used on a frequent basis was more than enough for her specific transportation needs, albeit adding that she might come around and try a cargo bike eventually if she was to visit the adjacent garden centre to stock up her balcony with new plants and flowers (Rivera, Henriksson et al. 2014). Yet another non-user explained that she would probably not use the cargo-bikes as she had a car and that she figured that her dog probably would be quite difficult to keep sitting tight in the box of the cargo bike anyway. Many non-users also expressed that the cargo bikes seemed great for families with small children.

Shove et al. (2012) state that community and practice constitute each other and, thus "cannot be willed into existence or designed from afar." (p. 68). This implies that for a practice to recruit new practitioners voluntarily there is much to be required in terms of participation, learning and sharing. From the interviews it is clear that although the cargo bike pool was seen positively by both non-users as well as the users among the residents of the housing association, the main users during the trial were members of multi-person households expressing a desire to live car-free lives that found the cargo bikes useful for (some) of their transportation needs. Additionally, most of the cargo bike riders also rode on regular bike on a regular basis. Finally, at least a few of the most frequent users had had extensive discussions about acquiring a cargo bike of their own before the trial. For the residents that were in process of acquiring a cargo bike it is fair to assume that the images and consequently meaning elements associated with the practice of cargo biking were already in place and thus facilitated the use of the cargo bikes. For the other residents this may not have been the case and consequently the practice had difficulties recruiting practitioners outside the group of 'aficionados'.

If we instead look at everyday transportation from another perspective the cargo bike comes in as a new material element to be fitted into an already existing set of practices for dealing with the transportation needs that arise in the everyday life. For some of the residents the access to cargo bikes led to a change in how trips could be imagined and thus useful for in relation to other transportation modes such as going by car, regular bike, walking and public transportation. In this sense the cargo bike proved to fit into the portfolio of sustainable travel modes for everyday transports.

The residents who used the cargo bikes did so for different types of trips, e.g. trips to supermarkets for weekly shopping, and for transporting other bulky or heavy items. The cargo bikes have also been used to transport (smaller) children to different places. Many of the trips that the bikes have been used for can be characterized as outing trips for leisure. Our interviews also indicate that after the users have passed the first exploratory phase the bikes have also been used for a wider variant of errands, even though outing trips still remain popular.

The frequent occurrence of exploratory trips we believe, demonstrate that the access to cargo bikes can be seen as creating opportunities or opening new possibilities. That is, a lot of these trips would perhaps never have happened, because the possibility to make them was not yet available. Having access to a cargo bike pool has led residents to make trips that they might not previously known they were going to make. 'Possibility opening' has a dual connotation; it means both being able to make trips that otherwise would not have been made but also being able to make trips that would otherwise have required a car. In some cases perhaps these two types of trips blend together and are different aspects of the same type of trip. Yet another way to express this is that the availability of a cargo bike provides the residents with a type of agency previously lacking. For the residents with an explicitly stated car-free lifestyle that ended up using the cargo bikes, access to cargo bikes definitely helped them to resolve their everyday transportation in a way that was consistent with how they want to live. This desired kind of lifestyle is also related to preferences of residence location.

The specific location of the trial also contributed to its success as Bagarmossen is an increasingly attractive place to live. Bagarmossen is not a place people end up in for no reason but rather a place that people seek out a variety of reasons, including the proximity to nature, good communications, the fact that there is no through traffic and that it is a safe and secure place compared to other similar areas at the same distance from the inner city. The interviewees revealed choice of residence in relation to public transport and (to some extent) their workplace as very important aspects. The fact that Bagarmossen and its surroundings are relatively flat and 'bike-friendly' also contributes to giving the trial certain favourable prerequisites.

The cargo bike trial suggests that even though it is difficult to change everyday transport practices it is not impossible but that changes cannot be foreseen. It is a complex process and it is hard to single out isolated factors that influence a person to start doing something in a different way than before. Nevertheless the main finding in Paper III is that the potential of a cargo bike pool would be enhanced if introduced as a part of a wider package of mobility services to encourage low-carbon mobility. Riding cargo bikes is not perceived as a viable alternative for all residents, or in all situations, but having access to a cargo bike pool seems to help create space for some residents to live a car-free everyday life and as such also help to showcase sustainable alternatives for transportation in everyday life for non-users as well.

Paper IV tells the story of how the employees at a large transnational telecom company understood and accommodated the implemented travel and meeting policies that regulate business communication. The study was conducted as part of a project looking into sustainable social practices and drivers and barriers for mediated meetings. TeliaSonera was chosen as it was a partner in CESC Centre for Sustainable Communications and had successfully implemented a meeting policy with consequential decrease in work related travel. The aim of our study was to examine the changes in practices and assess the link between policy, employee perspectives on meetings, work efficiency, the environment and actual behavioural change. We wanted to this by

focussing on how the employees experienced and acted upon policy implementations in their everyday working life. More specifically we wanted to explore employee decisions on when, how and why to hold meetings. The participants of the study were selected by a gatekeeper who was involved in the mediated meetings project at CESC and employed at TeliaSonera. The participants were chosen by the gatekeeper based on their specific roles at the company as well as their interest in environmental goals and corporate social responsibility issues. The group of participants was also chosen to include employees at different departments, varying responsibilities, differences in work experience at the company and geographical location. Both men and women were interviewed but the male participants were in majority. In the paper the informants are deliberately anonymized to ensure that the participants of the study could speak freely about the topics raised in the interviews.

The meeting practices at TeliaSonera as such are part of the workplace practice and encompass an array of different communication practices such as physically located meetings, chat, online internet-based meetings with sharing of documents, telephone meetings and video meetings. Part of office communication was also the type that occurs unplanned and spontaneous in corridors, lunch room and at the 'fika'. The most common form of meetings seemed to be the telephone meeting, according to the interviewees. This was the norm at the time of our study, and face-to-face meetings were not, which indicates a change of practice due to the implemented meeting policy and associated travel policy and travel bans.

Even though mediated meetings in general, and telephone meetings in particular, were the most common form of meeting at TeliaSonera, the view among the employees that we interviewed towards them was somewhat mixed. The employees often expressed that it was essential to meet their co-workers at least once in person and related getting to know one another with notions of work efficiency and facilitating the work process. Most employees also reasoned that only having online communication led to stilted social relations and weaker sense of belonging to the team. Mediated meetings and communication were seen as inferior because of them not providing opportunities to have informal chats during breaks and 'fikas', leading to communication remaining formal and disengaged participation.

According to policy documents, guidelines and the discussions that preceded the meeting and travel policies, virtual meetings were preferred due to savings, increasing workplace efficiency, contributing to a better life quality for the employees, and decreasing the company's environmental impact. According to policy documents the optimal meeting at Telia Sonera is 'short, structured and creative'. However, in the policy documents as well as in email communications, it is clear that TeliaSonera managers understand mediated meetings not always being the best alternative when it comes to workplace efficiency. According to policy documents meeting in person is the alternative to mediated meeting and type of meetings which are deemed better suited for the former alternative included; kick-offs; support meetings, meetings that involve deep discussions and longer meetings.

Since the policy changes as well as the ban on travel with subsequent 'mini-bans' were implemented by the policymakers and management within TeliaSonera they had legitimacy and employees could not but oblige to the new policies and alter their work and meeting practices accordingly. The new practices thus were successful with regard to the massive recruitment of new practitioners. Even so how these new practices were perceived by the employees was not entirely without friction. Notions of what constitutes good collaboration and successful team work practices still relied heavily on the assumption that face-to-face meetings were superior to other forms of meetings. This

consequently gave way to the ongoing negotiations for being allowed certain trips for meetings that some employees expressed in our interviews.

Another take on the TeliaSonera case could be to focus on change. While there has been a change of meeting practices and travel practices at TeliaSonera the employees' statements tell a slightly different story. In our interviews the employees focused on what in their work and meeting practices they considered was possible to change and they stressed the notion of the value of face-to-face meetings. Interestingly enough this particular view on meetings was in fact reinforced in the company's policy documents on meetings. On a more general level most interviewees expressed a positive view on the company's communication policy and 'no travel' bans in relation not having to travel as part of their work practice. Yet the employees also expressed concerns on the limits of said policy and bans. Statements such as "we can't cut down anymore on travel" were voiced on several occasions. This could be interpreted as a new normality or norm emerging at the workplace. Another interpretation could be employees expressing resistance to top-down mandates and indicate the power dynamic within the company. Feelings of being hindered from performing optimally at work due to inflexible company policies and regulations could be read as feelings of powerlessness which in turn stands in conflict with both how management and employees envision working at TeliaSonera. Lundqvist (2010) notes that even though ICT decreases the importance of distance, through offering easy accessible contact, it seems to at the same time increase the need for more face-to-face meetings. Lundqvist's point is consistent to some extent with our findings. It does not, however, explain why the need to meet in person is so salient in the employees' statements. The company policy which distinguishes between mediated and face-to-face meetings could possibly provide a clue. Conventional views on what constitutes a meeting, how and why it should be held imbues the policy as well as the employees' views. A more dynamic view on what constitutes work collaboration and communication could perhaps be one way to readdress more sustainable work practices. Work practices are by no means static and change over time, something that this case study illustrates. The case study also illustrates how policies can have unintended outcomes, in this case the enduring view that meetings in person is superior to mediated meetings and the continuous negotiation between management and employees for being allowed to travel for meetings. Finally the case study illustrates the importance of designing policies in a manner that open up for sustainable practices through a combination of regulation, re-definition of meetings and the material and technological means for mediated meetings. Even so, the outcome can be surprising and contested by the practitioners.

8 Concluding Discussion

ICT is transforming our everyday life and we are in the midst of this rapid transformation. ICT is attributed with great potential for facilitating sustainability and at the same time the fast development of products and services are themselves also leading to changed practices as well as causing highly material repercussions in the form of obsolete devices that become e-waste and an increasing energy demand. The complexity of these ongoing processes can be difficult to analyse and thus problematic to pinpoint exactly what can be considered as the main implications from a sustainability point of view. In Papers I and II some of these aspects have been explored and conceptualized from a practice theory perspective. The conclusions drawn in the Papers I and II can be summarized as follows; changes in practices occur as new technology finds its way into everyday life and co-evolve together with the technology itself along with the visions described in the techno-optimistic discourses that they are part of. Changes in practices inevitably will have environmental impacts, both negative and positive, and for policy-makers it is imperative to take this into consideration when planning for the future and actively support and facilitate sustainable social practices.

Paper I suggests one way to address these issues by introducing the concept of ICT practice which is defined in Paper I as: a recurrent situated action where ICT is experienced as a meaningful material element for performing that action. The definition highlights the element of ICT as integral part of such a practice and draws attention to the ever increasing role that ICT plays in the majority of daily doings and practices and how this process is driven also by the discourses on 'smart everything' and Internet of things.

Another way to approach the issue, suggested in Paper II, is to look at the second order effects of ICT devices and services. Second order effects, however, can be very difficult to foresee and assess but nevertheless need to be taken into account when discussing how new technology and interventions could be received and used. One way to address second order effects is by having as starting point how practices are changing by introducing new ICT devices and services. This is not to say that this is the only way to describe and assess potential second order effects but it can be one way, and it can be a way to encompass the integral elements; material as well as bodily-mental elements that constitute a specific practice. It also can provide a starting point for looking at how practices co-evolve together with new technology and services. It does not however say anything about the future, but it can help to rethink or reframe how we imagine future practices, something that is not always done in future scenarios regarding for example energy demand and policy discussions regarding how to manage energy demand. Still most environmental assessments are quantitative in some aspects and the question is how to overbridge and try to design new methodologies that rest upon assumptions based in an understanding of social practices to assess potential second order effects of future services and devices. These methodological issues need to be further explored.

There is a belief/wish that interventions can/will change existing practices, these potential changes, however, from a practice perspective it becomes clear that how practices change depend on a variety of different factors which are more or less difficult to impact for the individual practitioner. Offering alternative mobility can be one way of changing transportation practices in a more sustainable direction. This is also an outcome in paper III. It is however important to stress that in order for a certain practice to recruit more practitioners more over-arching factors such as the whole urban infrastructure and transport system or larger societal time schedules for example need to be considered from a decision-making perspective. Just implementing a cargo-bike pool

is not enough as the society at large still is mainly catering to car drivers and not cargo bikers through roads and parking facilities and so on. From a micro perspective on the other hand, it is not unthinkable that the cargo pool will recruit more users in the housing association and that the concept itself could spread to other housing associations, local council owned estates and other neighbourhoods. There are indications that confirm that this is happening at the moment around in greater Stockholm and other cities in Sweden.

The two cases presented in Papers III and IV differ in what type of interventions that were implemented and this also gives a difference in outcome. In Paper III the intervention was voluntary; the residents had the opportunity to book and use the cargo bikes as they wished. In Paper IV the new meetings policy with adhering travel bans was compulsory for the employees. The trial with cargo bike pool, although perceived as positive by a majority of the residents, was only used by a fraction of them whereas all of the employees wanting or not contributed to the lowering the GHG emissions caused by travelling for meetings at TeliaSonera by the mere fact that they could not go about as they had before.

The outcomes of interventions, whether voluntary or compulsory, depend on that people will engage in them because of them being attractive or suitable in one way or another. They are however not necessarily in themselves incentivizing enough to be implemented. Why some practices catch on and recruit new practitioners and others don't is also more complex than at first glance. In a discussion on how the congestion charges in London have and have not influenced the travel habits of Londoners Shove and Walker (2010) state that the responses to the congestion scheme depended on existing habits and commitments that in turn depended on their specific social histories and path dependent trajectories. Shove and Walker (2010) conclude that it is important to take into consideration all elements of practice and to ask "how patterns and practices of daily life interrelate, erode and reinforce each other" (Shove and Walker 2010: 476). What this means is that from a practice perspective it is crucial not only to look at a specific practice but also how a practice is part of a greater complex of practices. Intervening with one practice, such as introducing cargo biking as alternative transportation mode or substituting travel for meetings with mediated meetings, also means that this in turn will affect other things in the everyday life of people, whether this encompasses working in geographically dispersed teams, shopping groceries, picking up children at school or transporting children to activities, and so on. This said, it is clear that compulsory interventions, such as office wide travel bans and a close to non-negotiable meeting policy, will have profound effect on the 'business as usual' work practices relating to travel and meetings. At the same time it is clear that a multinational company with geographically dispersed work teams will have an uneasy tension between already set work practices and the discourse on what constitutes good and proper meetings. The changes in practices might very well creep into place as is also illustrated by the way that telephone meetings were the first hand choice of meeting form at TeliaSonera in the interviews.

Practices change not always dramatically through powerful top-down intervention but more often creeping and these small, mundane adjustments are key to understanding how new practices come into place. The way that ICT and mobile devices have become more and more important for everyday life and the way that everyday travel practices change slowly provide good evidence for this point. The same can be said of how new practices recruit new practitioners. Therefore it is not necessarily so that intervention will have the outcome that was intended, but rather the outcome might be something else, or should be assessed differently and not as success or failure.

My final point that I wish to put forward is to consider how we validate the results from qualitative research. I see a danger in trying to use the results of qualitative studies as evidence for whether an intervention is successful or not. I believe firmly that this is not the role of the type of research that has been presented in this thesis. The role of the qualitative research in this thesis is, in my opinion, to provide something else, namely insight into how changing practices come and don't come about, to try to illustrate the ambiguity of these processes that entail a multitude of elements and factors, and to analyse the implications from a sustainable policy perspective. The results that were discussed in the former chapter of this thesis prove this. To try to illustrate the entanglements of the different social practices that together form the day to day and this way inform a deeper and more informed discussion on how policies, decisions and planning can be designed without leaning on the more simplified assumptions on how habits and practices might change in order to become more environmentally sustainable. It is my hope that this comes through in this thesis.

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