Department of Management Studies

Demanding energy in everyday life

Insights from wood heating into theories of social practice

Jenny Rinkinen

Aalto University

DOCTORAL DISSERTATIONS

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Jenny Rinkinen

Aalto University
School of Business
Department of Management Studies

Main dissertation advisor
Dr Mikko Jalas, Aalto University School of Arts, Design and Architecture, Finland

Co-dissertation advisor
Professor Raimo Lovio, Aalto University School of Business, Finland

Opponent
Professor Alan Warde, University of Manchester, UK

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Abstract

Aalto University, P.O. Box 11000, FI-00076 Aalto www.aalto.fi

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Abstract

This thesis takes a practice theoretical perspective on domestic energy use. In doing so, it follows the emerging research approach in which energy use is examined in relation to mundane social practices.

Drawing on studies on everyday life and material culture studies, this thesis contributes to the practice theoretical discussion by exploring the role of materiality and temporality in social practices. The thesis comprises of four research papers that focus on domestic space heating, and in particular on the small-scale use of solid firewood in Finnish detached houses. Each of the papers foregrounds the dynamic aspects of heating by drawing attention to issues of flexibility and inflexibility, active and dormant, and novel and existing engagements.

The study draws on two sources of empirical material: on a pre-existing diary archive, and on interviews conducted in Finnish households on two distinctive events, power cuts and moving house. As a methodological contribution, the study exemplifies how language-based methods such as diaries may be used to study materiality and expose practices not as pre-given entities, but as emerging in the everyday.

While the literature on social practices has strongly emphasized the importance of practicality, convenience, and comfort in human action, questions of inconvenience, uselessness, and ineffectiveness are less frequently touched upon. Highlighting the material and temporal aspects of practice extends questions of practicality and 'doability', which are often stressed in practice theory, to include evaluative, a-teleological, and aesthetic engagements. The findings of this study speak against the general societal interest in increasing convenience, and suggest that demanding practices (such as domestic wood heating) are valued for the achievements they yield in and between performances. Relative and negotiated convenience is introduced as a notion to demonstrate how time-demanding and laborious tasks become valued, and persist ingrained in everyday life.

This study suggests that existing material arrangements are important backbones for new hybrid heating solutions, and are relevant in exploring the ways in which new material elements, meanings, and competences are introduced to practices, such as domestic heating. In finding new ways to realize sustainable forms of practice, the challenge of policy-making is to better understand the materialities and temporalities of energy use.

Keywords social practice, everyday life, materiality, temporality, convenience, energy service, energy technology, diary studies, wood heating

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In Weetwood, Leeds
October 2015

Jenny Rinkinen

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List of papers

1. Rinkinen, J., Jalas, M. & Shove, E. (2015) Object relations in accounts of everyday life. *Sociology*, 49(5): 870-885.

2. Jalas, M. & Rinkinen, J. (2013) Stacking wood and staying warm: Time, temporality and housework around domestic heating systems. *Journal of Consumer Culture,* 1-18. DOI: 10.1177/1469540513509639.

3. Rinkinen, J. (2013) Electricity blackouts and hybrid systems of provision: Users and the 'reflective practice'. *Energy, Society and Sustainability,* 3(25): 1-10.

4. Rinkinen, J. & Jalas, M. (unpublished essay) Dynamics of heat: Houses, new dwellers and the formation of heating practices.

Preface

Every thesis has a distinctive character and is a result of its surroundings – this one at hand is not an exception.

The ideas compiled to this thesis are strongly rooted in problems and ideas set out in project research – first, with EnPath (2009–2012) studying system-level energy transitions, and then continued in LAICA (2011–2014), which focused on the local dynamics of energy innovation from various perspectives. These projects, funded by the Academy of Finland, were carried out by researchers from my academic unit, the Department of Management Studies at Aalto University School of Business, and by scholars from the National Consumer Research Centre (now Consumer Society Research Centre), the Finnish Environment Institute (SYKE), and Aalto University School of Arts, Design and Architecture. These two projects contributed to the evolving research and policy interest in energy transitions and environmental innovation. They also signified a move towards a paradigm, which strictly intertwines the reality and nature of everyday life with technological realm, and yields new questions on the political agenda in tackling issues of climate change and unsustainability.

The LAICA project, in particular, had a pivotal role in finding the path and focus for this thesis. One of the perspectives advanced in the project was the innovativeness of users, and in particular the question of how users take part in the modification and diffusion of low-carbon energy technologies. The findings of the project demonstrate that the role of the user is becoming increasingly central in energy transitions: changes in energy technologies are closely intertwined with changes in users' roles, as Jouni Juntunen (2014) argues in his doctoral thesis. To broaden the focus from lead users and innovators, Mikko Jalas and I deployed a somewhat more general approach to delve into the very everyday life of Finnish energy users. We found our way to an archive of diaries written by Finns (SKS KRA, 1999; 2009), and from its manifold, and often witty and touching pages unfolded the world of wood heating and its significance yet ordinariness in the diarists' daily life. The diary pages lit the spark for this thesis, which opens up the world of wood heating from an everyday perspective, examining the practice of keeping warm in the mundane flow and pressure points of everyday life.

It goes without saying that wood heating as an empirical phenomenon raises a number of ecologically significant and politically sensitive questions. Considering this, it may come as a surprise that this thesis does not raise explicit discussion on many of the policy issues around wood heating such as sustainable forestry, carbon sinks and levels of local emissions. The perspective of social

practices focuses on the embedding of wood heating in everyday life, and depicts wood heating as a rather robust practice, which is historically, socially and culturally ingrained. What kinds of opportunities or challenges this everyday approach evokes in building paths to sustainability is the question asked along the lines of this thesis.

1. Introduction

> 'Have you already made the fire?' my wife calls from upstairs. I reply a bit dishonestly: I am about to do it. I stack firewood that we made the summer before last at Mustalampi into the oven. I crumple old newspaper in between the wood. I fill the whole oven and light it, and then go and open a small window. Opening the window is important, because the house has mechanical ventilation that creates low pressure. One must therefore take in additional air so that the smoke goes out of the chimney and does not come in from the hatch. Soon there is a humming noise and blinking light behind the glass of the hatch. Live fire is nice to watch, so I drag a stool next to the fire and watch. The heat of live fire is also cosier than electric heat. I then get a basketful of firewood to have it warm for tomorrow. The northeast wind and the crisp frost feel on the face and on my ears. [...]. I return home quickly to get warm. The fire is almost gone. I stoke the glowing cinders with a hook. My hands and face start burning. Great feeling. My wife hears me from upstairs and asks: Shall we put the food in the grill. I answer: It is noon so it is time. I only watch over this fire. (SKS Diary, 1999/39319)

1.1 Energy and social practices

To yield new thinking for tackling issues of increasing resource use and climate change, and to overcome some of the barriers in the dominant paradigms, scholars have turned to discussing practices as the locus of interest in studying social change (e.g. Wilk, 2002; Røpke, 2009; Spaargaren, 2011; Shove et al., 2012; Shove & Spurling, 2013; Strengers & Maller, 2014). Theories of social practice not only challenge the overriding emphasis on technological transitions and systems of supply, and the consequent technological determinism but also urge studies on consumption and energy demand to move beyond the individualist paradigm of consumerism. Questions of what consumption and energy are for are brought to the fore (Warde, 2005; Shove, 2010b; Shove & Walker, 2014).

This emerging field of research contributes to the broader practice turn in social sciences (Schatzki et al., 2001), which has gained momentum across disciplines in various guises. The plenum of social practices is an ever-expanding web of linkages, and as such provides a rich avenue for critical reflection (Schatzki, 2014). Appreciating the ways in which practices weave together practical understandings and doings, particular aims and tactics along with moral judgements helps in understanding stability and change in the different domains of everyday life.

Especially in the context of sustainability, the practice turn is largely a political endeavour (Shove, 2010a). One of the starting points for practice-based policy is acknowledging more openly that problems of unsustainability and solutions for sustainability are not only derived top down, or outside users' everyday life, but rather arrive from local contexts and everyday experiences. As everyday life is becoming increasingly complex, the emergence, reproduction and disappearance of social practices have strong but hard-to-grasp consequences for energy use.

Against this, the conundrum of energy has been raised into the discussion as a distinctive challenge in theories of practice. A set of questions concerning energy demand has been raised, especially in the work of Elizabeth Shove and colleagues (e.g. Guy & Shove, 2000; Chappells & Shove, 2008; Shove & Walker, 2014): For what purposes is energy used? How do social practices constitute the demand for energy? How and why are norms of convenience and comfort converging? How do technologies and products not only cling onto the everyday but also change it in a constitutive manner and affect energy use? In all these questions, and in practice approaches in general, energy use is not seen as an act of an individual consumer, or as a side effect of the technology in use, but rather energy spawns the practices it is used for: energy is used for ordinary, sometimes taken-for-granted practices such as eating, dwelling, commuting, travelling and caring for others and oneself. This approach succeeds in exposing those practices that often remain hidden or reinforced as non-negotiable and non-discretionary activity but which have a significant role in energy use (Moloney & Strengers, 2014).

When studying energy use from a practice theoretical perspective, many zoom in to the so-called 'energy practices', which compile dispersed energy-related activities within a single focus. For example, smart metering, energy efficiency and community energy are examples of domains that assemble doings related to everyday life energy use, and as such can be interest of research and a target of policy-making (e.g. Gram-Hanssen, 2010; Hargreaves et al., 2013; Higginson et al., 2014; Naus et al., 2014). Taking a stronger practice view, however, is to say that energy is consumed merely for the sake of other practices, and as such energy or energy efficiency *per se* should not be the focus of attention, but rather, the mundane social practices it is used for. From this view, energy-intensive practices are already repeatedly, frequently and without exception the target of policy, and the novel question then is how a broader understanding of practice may be more effectively deployed in the policy processes (Shove, 2010b). Moreover, practice studies have not only steered attention to the energy intensiveness of practices, but it is also increasingly acknowledged that the ways in which activities and practices are synchronised (Southerton, 2003, 2013) have significant consequences for energy demand (Walker, 2014). The dynamics between synchronization and other temporal aspects of energy-intensive practices are closely related to many techno-political interventions (Strengers, 2013; Walker, 2014; see also Spurling, 2015).

Given that energy use is often a hidden and unnoticed aspect of practice, seizing hold of it in practices, both analytically and conceptually, is tricky. Many

day-to-day activities such as cooking rely on concealed grids that deliver undisrupted electricity through complex infrastructures. It follows that energy is often embedded in largely invisible infrastructures and in the mundane use of services and material things, and it is only partially made visible through the practices it enables (Shove & Chappells, 2001). Vannini and Taggart (2013) have further argued that even if fuel and energy could be grasped as materials undergoing constant circulation and transformation, their applicability only comes through via their linkages to the practices that they are resources for, such as moving, cooking, and keeping warm.

1.1.1 Material domain of everyday life

The question of energy rather intriguingly intertwines with the technological and material domain of everyday life. In practice theories, material things are not accounted as mere symbolic artefacts, but their role in the dynamics of social change, stability and order, is acknowledged and emphasised. This is done, for example, by exposing 'hidden' roles of technological novelties. As Shove et al. (2007: 12) explain: "The normally invisible role of material objects and their significance for the accomplishment of daily routine is momentarily evident when technological innovations provoke or enable changes in how and by whom tasks are defined and accomplished, and in how people organize their time."

This appreciation of how things are 'handled' and how they form constitutive, effective elements of social practices (Reckwitz, 2002b: 210) is argued to bring nuances to the technology optimists' and energy behaviouralists' approaches to how new technologies affect practices (Wilhite, 2008). Moreover, objects are seen to bring out durability and frequency, as they both participate in the entity of practice and make its performance durable over time, hence affecting the change dynamics of social practices. From practice-theoretical thinking, it also follows that changes in practices are relevant, not changes in technology or attitudes *per se*: 'practicality' and the logic of practices are more than technology. Despite this notion, however, the processes of how technologies and technological systems gather and retain momentum play an important part in the forming of practices (Hughes, 1993).

However, many of the empirical accounts that place materiality as an element of practice (Shove et al., 2012) tend to focus on discrete objects of consumption and use, such as walking sticks (Pantzar & Shove, 2005), freezers, (Hand & Shove, 2007), air-conditioners (Strengers, 2010), and stand-by devices (Gram-Hanssen, 2010). This, however, often downplays the broader role of objects and more complex material arrangements. It also appears that energy yields specific challenges to the understanding of things as constitutive element of practices (Shove & Walker, 2014; Shove et al., 2015). In the few practice theoretical accounts that conceptualise energy in explicit terms, energy is ultimately seen as an ingredient in practice, which is not a unified substance or enacted in social practice in a unified matter (Shove & Walker, 2015; Strengers & Maller, 2012).

While issues of matter, things and materiality are already widely discussed across social sciences, and materiality has received increasing attention in recent advances in practice theories, its role in all its nuances is subject to debate. Not

only is the conceptualisation of material things varied (Schatzki, 2010b; Shove, et al., 2012), but there has also been criticism on how much power objects should be given over, for instance, their improvised use (Warde, 2014). Even though practice theorists have recognised the dynamics between technology, resources, materiality and practices (Schatzki, 2003, 2010b), and build rather materialistic versions of practice, conceptualising a balanced yet comprehensive understanding of materiality has remained at the outskirts of discussions until very recently (Shove & Walker, 2014; Shove et al., 2015). It also remains, as Thévenot (2001) has argued, that there is a need to develop practice theory to better take into account the dynamic and mutually responsive ways in which people engage with the material world, which would contribute to a realist version of practice theory according to which there are no firm, established dispositions, routines or sets of skills that would pre-determine action in a resistant and changing world. This is also a temporal question. While considerable emphasis has been placed on the cultural differences in understandings and appreciations of time, and, how the study of time can help to map out differences between cultures (Levine, 1997), time is too often considered detached from the material. It remains that links are not deeply discussed between the material world and the temporal organization of practices.

These notions imply that one of the challenges of the practice approach is to better acknowledge the characteristics of different resources that flow and float for service provision as well as the temporal nature of such flow. In particular, questions on how technologies fill up, characterise and orchestrate everyday life as they build path dependencies and have more or less open or closed scripts are particularly relevant in discussing the changing energy demands. Thus, technological changes, and the ways materiality as an element of practice evolves, orders and enables everyday life, provide an interesting route to study how energy-demanding practices have been developed and are developing.

1.1.2 Wood heating as a focal practice

One of the recent topics characterising the energy discussion is the call for an 'energiewende' – a move towards low-carbon energy provision (see Halme et al., 2014). Historically, the push towards low-carbon energy provision has to some extent agitated the 'greening' of large, centralized systems of provision, but on the other hand, a fair amount of investments, expectations and pressures are being directed to the development of distributed, smaller-scale provision (Bergek et al., 2013). Wood-based biofuels, in general, interestingly matter for both of these developments, as they can be utilised in different scales of provision from centralised provision to smaller scale on-site heating. Thus, due to the pressures of finding low-carbon fuels for centralised production and developments in the Finnish forestry sector, the use of wood fuel is increasingly tempting in energy policy (Lantiainen et al., 2014).

Beyond the investments in large-scale use, wood persists as an important fuel in small-scale heat provision. Wood has been a traditional fuel for heating houses, farms and recreational cottages in Finland, and its popularity is still

significant. More than 25% of the 1.1. million detached houses in Finland have solid wood as the main source of heat (Statistics Finland, 2013). In 2013, almost 40% of the energy use of Finnish detached houses was from wood sources, with electricity (30%), heat pumps (11%), oil (10%) and district heating (6%) accounting for the rest. The last detailed statistical outlook on wood fuel use in Finnish detached houses reveals that between 1993 and 2008, its use increased by 20% (Torvelainen, 2009). However, wood heating is more and more often part of hybrid solutions: whereas 30 years ago, 40% of all Finnish houses, including apartment flats, were heated *only* by wood, in the early 2010s it is only about 10% who use wood as the only source of heat (Statistics Finland, 2013).

While wood heating draws increasing policy attention and persists as a vital, even increasingly accepted form of domestic heating, it is not merely a question of supply. In cold climates, the heating of homes has come to play a central role in many respects, not only affecting how energy-intensive living is, but also how homes are designed, built and renovated, and how day-to-day life is organised around heating work and seasonality. Domestic wood-based space heating has an affective role of in peoples' lives, strong implications in terms of space and time, as well as demands and rewards in terms of the labour and coordination demanded to achieve it.

Unfolding empirical phenomena

Wood heating as an empirical phenomenon emerged from the diary archive data used in this study. Exploring domestic space heating was not the primary interest of this study, but rather the inquiry was guided by a broader understanding of how energy plays out in the accounts of everyday life. Wood heating, however, stood out as worthy of description and reflection for numerous diarists in the call. Therefore, inspired by the mundane descriptions and also the policy relevance of wood heating, a set of questions evolved: how do heating technologies become part of everyday life? What does it mean from the everyday perspective that wood or other resources are used as sources of heat? What types of work do these ways of heating require? What kind of relationship with the environment do they propose? All these questions relate to the call for more in-depth understanding of the everydayness of energy technologies, the dynamics between the old and new technologies, as well as the role of technology as an ordering act in the everyday.

To recognize the relevance of wood heating as a politically relevant, socially established, and empirically unfolding practice – and given its absence from social inquiries into the domain of everyday life – this study offers a detailed empirical case and a discussion on its dynamics as evidenced in the everyday life of wood heaters. In the following, this study is positioned by problematizing the question of materiality within theories of social practice.

1.2 Focus of the study

The empirical focus of this thesis is on small-scale wood heating in detached houses in Finland. As mentioned, wood heating is a relevant choice for study considering its affective role in peoples' lives, its implications in terms of space

and time for wood-heating householders, as well as its demands and rewards in terms of the labour and coordination demanded to achieve it. It is also largely overlooked as a social and cultural phenomenon in the recent social scientist energy research.

In my inquiry into wood heating practices, I draw from accounts of keeping warm and heating as narrated by 'ordinary Finns' (SKS KRA, 1999; 2009). These accounts are part of a diary call organised by the Finnish Literature Society in 1999 and 2009, which invited volunteers to keep a diary for one day. In addition to this diary data, I have interviewed Finnish households who have faced extensive power cuts during cold spells, as well as households who have moved house. These distinctive and disruptive events – power cuts and moving homes – reveal interesting dynamics for the stability and change in social practices, and effectively complement the diary data.

The analytical unit of the study is the 'practices of wood heating', referring to the spatial-temporal organisation of doings and sayings of wood-based small-scale heat delivery in the domestic sphere. Drawing boundaries to and defining these practices is challenging, and it discussed as part of the argument of the thesis. For now, it is sufficient to say that practices of wood heating consist of a bundle of practices, including fuelling, logging and forest management. These practices are recognisable entities carried out in performances, and they link more or less loosely to other social practices such as dwelling.

By focusing on heating with wood, this thesis steers attention from 'energy practices' (such as energy saving practices, smart metering), on the one hand, and practices that demand energy more implicitly, on the other, to the practices where energy use is partly visible and partly veiled, partly active and partly passive. In heating, energy is consumed for various services such as thermal comfort, but heating also unfolds energy as domestic work. Recent studies have pointed to the fair amount of relational dynamics in the practice of heating, which can be bodily (Vannini & Taggart, 2014), sensory (Royston, 2014), participatory (Juntunen, 2014), regulatory (Strengers, 2013), or temporal, as we show in one the thesis papers (Jalas & Rinkinen, 2013). Hence, seeing that energy use is dispersed into various practices in everyday life is not to say that it could not be a subject of more focused attention. Wood-based solutions as resilient and ingrained domestic means of heating offer new insights into the seemingly rapidly changing technological domain of everyday life.

Throughout the thesis, the focus is on heating practices in detached houses. Detached houses as a category of objects have many peculiarities that have not been fully acknowledged in research. While the standardization of housing has occurred, it remains that houses result from local production activities. Moreover, due to their long life span, houses need to be open to refurbishment and upgrading, and hence each and every house has its own particularities. Relatedly, houses also 'house' various materials of different scales – objects, bodies, technologies, and technical systems – as well as social norms of proper living. As a result, houses end up having layers of various technologies and local installations that bear witness to user preferences and local conditions to a far wider extent than most other products, such as used cars. A further important

aspect of houses is their circulation in the economy. Due to their long life span, property bound characters, and relatively high investment costs, houses are extensively traded in the secondary market. Detached houses hence imply a need to realign different elements of practices as occupants change and new technologies are introduced upon the existing materialities.

These choices of focus have implications for understanding the dynamics of social change. Most importantly, this study deviates from the dominant paradigm of behavioural studies, which pertains the individualist ontology in social sciences. I briefly outline why. While behaviourism has strongly affected the way that energy use has been approached, and marked the resulting policy measures, the numerous behavioural change programmes that have been implemented stress the value of increasing information and guidance in promoting change in household energy consumption through better consumer choices (Abrahamse et al., 2005). This approach has been effectively problematized with various arguments (van Vliet et al., 2005; Shove, 2010a; Moloney & Strengers, 2014), the fiercest one being that the overruling emphasis on increasing information stresses the responsibility of the individual too much, and is ineffective in prompting change (Shove, 2010b). To take practices as the analytical unit emphasises the embodied practical competence, doings and knowing *how*, rather than mental deliberation, reasoning and 'knowing *that*' (Warde, 2014). Critics have also pointed out that additional information does not request people to re-think their consumption needs, and the likelihood of rebound effects of energy efficiency remain (Gyberg & Palm, 2009). Furthermore, it has been argued that even though studies have demonstrated that providing more feedback to the consumer might affect the level of energy use, the persistence of these changes remains controversial (Gram-Hanssen, 2011). Disruptive interventions are seen ineffective unless distinctive social change occurs. Finally, top-down information-based approaches may indeed be unsuccessful in bringing about change, because they tend to fail to engage with vernacular knowledge of energy consumption and the links between energy and the services it provides, such as comfort and convenience (Shove, 2003, 2012).

Nevertheless, the approach emphasizing behavioural change is well-fitted in the conventional actions of policy-making and businesses, even though it often dismisses the more profound changes that are required (Shove, 2010a). A practice view adopted and developed in this thesis seeks to open up different kinds of questions. By focusing on the material and temporal dynamics of wood heating, this study encourages new discussions on the links between social life, materiality and sustainable forms of consumption. This calls for scrutinising and unravelling the material bases not as discrete entities, but as phenomena embedded in and intertwined with social practices. Whereas the focus of the study is on understanding heating in particular, this study makes a broader contribution to the understanding of energy in social practices and in the domain of everyday life. Moreover, drawing attention to materiality is not to grant it with too much power, but rather the aim is to contribute to a *balanced* account of materiality in social analysis.

1.3 Aims and research questions

This thesis has two specific objectives. The first is to understand the material and temporal dynamics of heating practices. In theories of practice, it is acknowledged that material arrangements and engagements have strong implications for social practices. Technologies aim at increasing temporal flexibility, but also have broader implications in standardising social norms and order, along with strong demands for resources. While questions of convenience and comfort are recognised as central in understanding energy demand (Shove, 2003, 2012), , the delegation and acceptance of strain and toil, on the other hand, are less frequently touched upon, even though they are at the core of understanding the dynamics of social practice. From a practice-theoretical perspective, applicable questions could be how and why onerous practices persist, even though they speak against the general societal development of increasing convenience. In answering these questions – intriguingly and against the presupposition – materiality can appear as a route to ask questions beyond pragmatic concerns, and point to the importance of different aesthetics appraisals, evaluations and criteria of good life and being. Unravelling materiality does not exclude the broader relationship between the features of practice such as skills, body, action, teleo-affective structure, meanings and understandings, and material arrangements, but rather it allows a study of the complex and dynamic ways in which materiality goes beyond practical concerns. Moreover, whereas the question of temporality is recognised as central in the organisation of social practices (e.g. Schatzki, 2010a; Shove et al., 2012), and some studies have delivered empirical qualitative findings on the temporal dimensions of practices (e.g. Southerton, 2006; Blue, 2013; Rantala & Valtonen, 2014), there have been fewer articulations on how to account for the links between temporality and materiality. Focusing on the links between temporality and materiality does not limit the inquiry to how time-demanding practices and technologies in use are, but rather acknowledges how material elements coordinate time, and how their use is coordinated by the temporal organisation of social practice.

The second objective of this thesis is to theorise practices from the everyday accounts of practitioners. Primarily, this objective is to a large extent methodological, as it emerged in the process of making sense of the empirical material – diary accounts – and from the need to understand such data in particular when working with practice theory. This study deploys a distinctive method for theorising practices from the everyday accounts of practitioners and for exploring the role of materiality in the changing everyday life. Whereas ethnography tends to have achieved a taken-for-granted status in practice studies, this study discusses and introduces the diary method, which gives voice to the practitioners to gain understanding of the messy practices of everyday life. This diary data set is treated to discern the multiple, dynamic and co-existing roles of things within and beyond matters of practicality and use. While language-based methods might at first seem problematic for the study of materiality, the aim of this thesis is to provide one illustration of how this can be achieved. Moreover, in working with the Finnish diary data, and in harking back

to the French tradition of everyday life studies, this study aims to enrich social theories of practice and contribute to an understanding of object relations within the sociology of everyday life. The diversity of the material domains arising from ordinary peoples' accounts of the mundane flow of events and the pressure points of everyday life is further reflected in the ways materiality is seen in the theories of social practice.

Each of the thesis papers is based on an empirical study and presents a distinctive perspective for the objectives of this thesis. The first paper discusses how materials 'figure', or play out, in the practices of keeping warm. This challenges to develop a more complex understanding of practice dynamics beyond practical concerns. The second paper delves into the relationship between temporality and materiality and discusses how materiality and temporality are entwined in a continuum. This evokes questions of the temporal patterning of consumption and the 'power' materiality has in such patterns. The third paper discusses practices when disrupted, and proposes dormancy as a material-temporal dimension of practice. Finally, the analysis of the fourth paper focuses on the alignment dynamics between practitioners and material dynamics of practice by elevating houses as the locus of interest. Taken together, they all contribute to the main research problems of the thesis:

> *How are the material-temporal dynamics of heating practices performed and accepted as convenient in everyday life?*

The methodological research problem of this thesis is the following:

> *How can practices be theorised from the everyday accounts of practitioners?*

Theoretically, this study draws on theories of social practice (Schatzki, 1996, 2002; Reckwitz, 2002a; Warde, 2005; Shove et al. 2012), and especially on their understanding of materiality (Reckwitz, 2002b; Schatzki, 2010b; Shove et al., 2015). Studies on time and temporality (Fine, 1990, Lefebrve, 1991, 2004; Zerubavel, 1985; Southerton, 2006, 2013) as well as everyday life studies (Gardiner, 2000; Sheringham, 2006) and anthropological studies on material culture (Ingold, 1995, 2000, 2012; Miller, 1998, 2005; Highmore, 2002) are used in examining the imposing and enabling role of materiality.

1.4 Flow of the thesis

This thesis is composed of two parts. The first part summarises the research and outlines the main argument of the thesis, and the second part comprises the four thesis papers. The first part consists of six chapters. Chapter 2 is devoted to the theoretical trials of studying material and temporal dynamics in everyday life and in social practices. The ontology of everyday life is laid out, grounding and 'politicising' the research approach adopted in this thesis. The chapter then moves on to elaborate on the development of practice theory in different fields,

and distinguishes between different 'waves' of practice studies. The chapter also discusses theories of social practice with a particular focus on the definition and organisation of practice, and shows how understandings of materiality in and for practices are varied.

Chapter 3 reviews the recent literature on practice-based approaches to domestic space heating, and grounds the first research problem in relation to existing empirical literature. The chapter discusses how practice theory has been utilised in challenging the standardised conventions of social norms, such as comfort, and how literature depicts the different forms of engagements with heat. These illustrate how practices have been theorised in the previous literature, and what kind of material and temporal dynamics have been emphasised. The chapter also introduces wood heating as a social practice.

Chapter 4 is a discussion on the methodology, data and methods of the study. The methodological outline also serves to better establish a radical mode of intimacy with the material world and to point to diaries as a particular method to approach such intimate phenomena of everyday life. The chapter starts by discussing everyday life as an object of study, focusing in particular on the question of situated language and registering of practices. It then discusses the use of diaries in research, diarists as 'everyday theorists', and the use of interviews. In chapter 5, the insights of the papers are summarised. The closing chapter gathers the concluding remarks and contributions to theories of social practice, and draws together conclusions on the methodology of carrying out practice-based research and policy-making. The chapter ends with suggestions for further studies on practices and sustainability.

2. Theorising social practice

This chapter presents an outline of theories of social practice. While chapter 3 turns to the empirical applications of practice theory in the fields of energy use and domestic heating, this section clarifies the theoretical and ontological underpinnings of such endeavours. The purpose of this theoretical chapter is two-fold: first, to outline my stance in the diverse bundle of theories of practice, and second, to point to material culture studies that contribute to the understanding of materiality and temporality in practice. I start by considering the term 'everyday life' as a connecting tissue for practices.

2.1 The politics of everyday life

The notions of everyday life, the everyday, the ordinary and daily life have been used and contested along the lines of scholars spanning disciplines: scholars of material culture, organizational studies, anthropology, media studies, feminism, design and geography have all turned to the ordinary flow of events when seeking new ways to grasp and make sense of 'the social'. For instance, scholars of material culture have highlighted the representations of everyday life (Highmore 2002; Moran, 2005; Miller, 2008), and sociologists have shown great breadth and diversity in engaging with everyday worlds, as evident in the everyday life special issue in *Sociology* (Neil & Muir, 2015). In human geography, everyday ontology is also taken to work against the individualistic and autonomous idea of social agency by capturing the onflow of everyday life (Thrift, 2008). Organisational scholars, on the other hand, have challenged the understanding of organisation as a structural and institutional constellation by drawing attention to the spatio-temporal dynamics of everyday activity, how they are generated, and how they operate within different contexts and over time (e.g. Feldman & Orlikowski, 2011; Fine & Hallett, 2014; Shortt, 2015).

The rather ambiguous notion of everyday life repeatedly points towards the ordinariness of the social through an intensity of details and interest in the mundane, on-going and fully familiar flow of events. In their extensive reviews, Gardiner (2000) and Sheringham (2006) trace the French roots of the concept, particularly in the works of Lefebvre, Certeau, Barthes, Benjamin, Simmel and Perec. This tradition stresses the quotidian or non-formalized aspects of social interaction as reviewed by Schatzki:

> Everyday life is related to the phenomenological notions of lifeworld and lived experience; Lefebvre even appropriated Heidegger's expression "being-in-the-world" to characterize the condition of the "corporeal subject." In another sense, everyday life is day-to-day life, how people live. It thereby embraces repetitiveness as well as the mundane, prosaic, or ordinary. In this sense, everyday life contrasts with "extraordinary life," which connotes singularity, uncommonness, and majesty (the sublime?). Everyday life is, thus, something like normal day-to-day life. The whole of reality, finally, of which everyday life is a level, also includes, most prominently, the capitalist system. (Schatzki, 2010a: 12)

The French tradition of everyday life studies works partly as a response to seeing everyday life as a merely descriptive or analytical concept, as largely done in interpretative sociological inquiries by, for instance, Berger and Luckmann, Goffman and Schütz (Gardiner, 2000: 5). In the mainstream interpretative approaches, it may be that the everyday collapses in the realm of the ordinary, but for the French scholars it also stands out as a domain that is potentially extraordinary (Gardiner, 2000: 6). However, everyday life can be both ordinary and extraordinary and still yield insights into the understanding of the social, as can be seen when tracking the history of the concept.

Behind the call for an everyday ontology have been three events: first, the emergence of the 'consumer' in the context of rapid modernization; second, the pervasiveness of functionalist ideology; and third, the rise of scientific sociology (Sheringham, 2006). Much of the critique also arises from the viewpoint of overlooked aesthetics (Highmore, 2002), and is directed to the overly technological and technocratic societies:

> [...] modernity systems are dominated by a technocratic or productivist logic. The overriding criterion of success within such systems is their efficient, utilitarian operation, rather than the satisfaction of non-instrumentalized needs as expressed by particular individuals and communities. It is to this technocratic rationality that the 'non-logical logics' of everyday life are generally contrasted and opposed [...] (Gardiner, 2000: 7)

Thus, from the point of view of the French school, the increasing interest in the seemingly neutral and even naive concept of everyday can be seen as a counteraction towards the capitalistic worldview, where the work is carried out in the economic paradigm. Everyday life is seen to be defenceless against the effects of commodification and bureaucratic structuring, and to exhibit tendencies towards passive consumerism and inward-looking, unreflective and routinized forms of doing (Gardiner, 2000: 13). For Lefebrve (1991), in particular, everyday life is an emancipatory project against capitalism and the bourgeois. He argues that whereas pre-modern societies organically dwelled in the everyday and the cycles and rhythms of the natural world, the consolidation of capitalism and bourgeois society dramatically changed this state of affairs (Lefebrve, 1991). As Gardiner (2000: 11) describes, "the cycle of daily life is severed progressively from the more 'advanced' sectors of modernity, including technological innovation, industrial production and mass communications." This emancipatory project requires a de-mystification of bourgeois ideology, which obscures the true nature of everyday life and suppresses its potentialities (Gardiner, 2000: 78).

These underlying motivations add an important political dimension to the notion of everyday life. For example, everyday life scholars expose that people can abstain from the roles that technocratic, productivist or consumerist logics project onto them, as exemplified by Benjamin (1999), for instance, in his account on idle, open-ended wandering around the city. Furthermore, Miller and Woodward (2012) have argued that rather than looking at the functioning of duty, obligation or sanctions, the ways in which people are attuned to what makes them and other people comfortable might be more apt for analysis than that of rational economic reasoning. Certeau (1984) also emphasises the political nature of everyday life, as he sees it as an outcome of the strategy of the weak: he brings forward the ruses, explicit tactics and responsive actions under the circumstances that are given by the powerful. Moreover, the ontology characterised by the messy everyday life and decentralised practitioner can be taken as reference to feminist ways of knowing, where research refrains from generalisations and the privileged positioning of the researcher (Smith, 1987). Recently, in the context of sustainability, the possibility of opening new political domains through the notion of everyday life has been made explicit:

> It [everyday life] is the domain of activity that the interventions of many policy makers, designers and engineers seek to reach. It is where we make our worlds and where our worlds make us. Therefore everyday life is a context of human creativity, innovation and change, and a site where processes towards a sustainable future might be initiated and nurtured. It is moreover, subsequently a locus from which and in which contemporary concerns about environment might be addressed (Pink 2012: 5).

It becomes clear that a central concern behind the theorizing of the everyday is to rescue the everyday from the neglect and oblivion to which it is consigned (Sheringham, 2006; Neal & Murji, 2015), and that everyday life is the ultimately the domain of policy. But as policy is fundamentally about means of control or forms of governmentality, the tension between the policy measures and the understanding of 'ungraspable' everyday life persists (see Bennett, 1992; Bratich et al., 2003). To work against this tension, everyday life as seen in the French school promotes an understanding of 'radical reflexivity', whereby people can develop a heightened understanding of their circumstances and use this comprehension as the basis of conscious action designed to alter repressive social conditions, as argued by Certeau (1984). Everyday life indeed incorporates a form of depth reflexivity, which is necessary in accounting for the ability that people display in adapting to new situations and coping with ongoing existential challenges, as well as in explaining the cross-cultural and historical variability that daily life manifests (Gardiner, 2000: 6). This reflexivity displays both discursive and pre-discursive, embodied qualities, as well as unconscious elements. It should be noted here that the reflexivity and action depicted here draws attention *the practitioner in relation to* everyday practice. In its empowering dimension, this understanding of reflexivity is appealing, but a stance that not all everyday scholars subscribe to. However, some level of consensus revolves around the idea that daily life is the 'connective tissue' that gives the totality its structure and coherence (Gardiner, 2000: 80).

Despite these advances, the ontology of everyday life often remains – but should not be – at odds with policy, and there is a gap between this scholarly tradition and policy-making. Therefore, the question at hands is: if we take everyday life as the common ground or connective tissue of all conceivable human thoughts and activities, how can we move forward? For many of those who take practices as their primary locus of interest, everyday life is a political domain. As Shove & Walker (2010: 472) put it, "a 'strong' emphasis on practice dynamics points to a new set of problems to do with the governance of seemingly uncontrollable processes that characterise the emergence, reproduction and disappearance of more and less sustainable patterns of daily life" (Shove & Walker, 2010: 472). A significant movement towards sustainability is likely to involve new expectations and understandings of everyday life and different forms of consumption and practice (Shove & Walker, 2010; Spaargaren, 2011), but such endeavour is not just a matter of paying closer attention to users or of emphasising their role within existing supply-oriented narratives, but more strongly examining how various sustainable practices come into existence, how they disappear and how interventions of various forms may be implicated in these dynamics (Shove & Walker, 2010). Introducing the French study of everyday life, and the notion of potentially extraordinary everyday life, runs in contradiction to most of the practice theoretical discussion of energy use. To ask what is doable and convenient, and how different elements (Shove et al., 2012) liaison with everyday life is to emphasise the practicality of everyday life over the expressive aspects, which are prevalent in the theories of the French slant.

2.2 Waves of practice research

Theorising the social as a practical activity has been widely applied across disciplines, ranging from studies on organisations (Orlikowski, 2007, Gherardi, 2009; Nicolini, 2012), strategy (Vaara & Whittington, 2012) and academic work (Räsänen, 2008) to studies on affects, body and gender (e.g. Butler, 2002). To illustrate, organizational theorists have turned to the possibilities of the practice lens to gain understanding on how activities are carried out in organizations and the relations among working, knowing, innovating and organizing, amongst other issues (e.g. Gherardi, 2009; Nicolini, 2012). Theories of social practice with interest in sustainability have also effectively spread out to many contexts: from eating (Halkier et al., 2011; Warde, 2013) to areas such as transport and mobility (Watson, 2012; Heisserer & Rau, 2015), health (Blue et al., 2014; Maller, 2015), design (Kuijer, 2014), global environmental governance (Spaargaren, 2011), and to disciplines such as ecological economics (Røpke, 2009).

While the applications of practice theories are dispersed, so too are the schools of thought initially contributing to the bundle of theories of practice. Some might even say that most of the significant sociologists and philosophers of the 20th century have more or less stated something that contributes to our understanding of the social as neither as an individualistic nor a structurally consisted phenomenon, but rather as something that can be traced down to

practices. However, writings by Bourdieu, Foucault, Giddens and Marx, as well as Wittgenstein and Heidegger, have been recognised as the most influential and central (see e.g. Schatzki, 1996, 2002; Shove et al., 2012). The principal deviating point for practice scholars is that they avoid taking behaviour as an outcome of personal preference and choice, and hence the focus of practice theories is neither on individualistic behaviour nor on structures, but practices are rather seen to carry these both. Behind this is the notion that reducing behaviour to one of the other extremes (activity or structures) provides a limited view on the social reality. For instance, Bourdieu and Giddens are against the opposing views such as objectivism-subjectivism and freedom-determinism, which have strongly shaped theoretical thinking about the social worlds (Layder, 2006).

What can then be described as the second wave of practice theories is developed and conceptualized in the central works of Schatzki (1996, 2001, 2002), Reckwitz (2002a, 2002b), Warde (2005), Kemmis (2009), Gherardi (2009), and later, Shove, Pantzar and Watson (2012). In this wave, scholars have been advancing the 'practice turn' as outlined by Schatzki (2001) and Reckwitz (2002a), and have moved towards comprehensive theories by assigning practices an ontological position. These works have delivered innovative approaches to analysing the social based on an ontological footing of practice, and commendably called for empirical efforts to test and develop these theories. This second wave has been notable for challenging existing understandings of significant phenomena of social change such as consumption (Warde, 2005; Shove & Pantzar, 2005), and strongly emphasising the role of materiality as inspired by Latour's (2005) actor-network theory (Shove et al., 2012).

Against this, a third wave of practice theories would then comprise studies that apply these theories empirically and provide conceptual insights and contributions to the second wave, as, for example, in consumer studies (e.g. Gram-Hanssen, 2011; Halkier & Jensen, 2011; Halkier et al., 2011; Sahakian & Wilhite, 2014; see Warde, 2014). This third wave is likewise scattered, ranging from studies on energy to areas such as marketing, architecture, public health and administrative work.

Distinguishing between 'weak' and 'strong' practice approaches illuminates the scattered nature of the third wave. As considered by Nicolini (2012), descriptive and a-theoretical ways of addressing practice through listing and enumerating practices and by taking them at face value constitutes a weak approach to practice. As Caldwell (2012) points out, without some degree of reflexive insight, practices can appear merely as theory-neutral descriptions of what is, rather than a potential theoretical mediation. A strong practice approach *explains* organizing in terms of practices instead of simply *registering* them. When taking a strong view on practice, studying situated practices has little advantage if done without explaining the "dynamics of everyday activity, how are these generated, and how they operate within different contexts and over time" (Feldman & Orlikowski, 2011: 1241). Warde (2014: 284) adds to this by noting that recent manifestos for practice-theoretic approaches usually do "little more than

rehearse earlier established concepts," suggesting that use of practice theory has been somewhat passive in terms of theory development. Similarly, when grouping different ways to turn to practice in social science, Eikeland and Nicolini (2012) argue that these turns have been largely insufficient, as they have failed to trigger critical dialogue and immanent critique. Nevertheless, when recognising this scattered nature of empirical work, it seems that one of the most important tasks for practice scholars acting in a given field is to maintain some level of coherence to ensure a strong contribution in the practice of social sciences. With this in mind, we now turn to the important endeavour of defining practice.

2.3 Defining social practice

2.3.1 Flat ontology and the decentralised subject

Practice theory is commonly taken as a description of the 'micro' happenings of social life. However, the theoretical thinking that Schatzki (2002), Shove with her colleagues (2012) and others (e.g. Reckwitz, 2002; Warde, 2005) generate, and on which this thesis largely leans, is not limited to performances on the detailed level of social life, but the aim is rather to understand "the nature of social existence, what it consists in, and the character of its transformation" (Schatkzi, 2002: xi).

To fully grasp the distinctive character of practice theory is to recognise that it builds on flat ontology (Schatzki, 2011) or 'site ontology' (Schatzki, 2005). This means that practice theory is not hierarchical but instead relational. Practices link to other practices through bundles, which form constellations, and finally a large plenum of practices and arrangements (Schatzki, 2014). For example, when practice theorists talk about social fields or institutions, they talk about nothing more than nexuses and sequences of social practices. This also means demoting the distinction between micro, meso and macro levels of practice:

> All social phenomena … are slices or sets of features of the plenum of practices and arrangements, differing simply in the continuity, density and spatial-temporal spread and form of the practices, arrangements and relations that compose them. It follows that all social phenomena – large or small, fleeting or persistent, micro or macro – have the same basic ingredients and constitution. (Schatzki, 2014: 16)

What follows from flat ontology is that in theories of practice, context does not exist separately in its traditional sense. The situated enactments of a practice – those moments when practices are carried out – inherently contain what are typically externalized as the context or explanatory force. Changes in how elements of practices link (Shove et al., 2012), as well as changes in other practices lead to the reorganisation of practices, their teleo-affective structure, and what is considered to be appropriate (Schatzki, 2002).

The flat ontology of practice theory has implications for the understanding of the individual. Actors are decentralised by giving them roles as mere carriers of practice. In this act, a 'complete' individual who is, for example, an actor in the market is turned into an individual who is a carrier of multiple practices.

Simultaneously, the focus shifts from the acting, decision-making individual to the practices. The terms 'user' in design, 'consumer' in consumption studies, and other actor groups such as 'citizens' and 'residents', place the individual in certain functional contexts, such as markets, politics or urban areas. The notion of users, for example, refers to the agency of operating within technical systems, whereas citizens denote community-based social and political agency. However, these functional contexts ultimately simply bring together individual actors, and hence the understanding of a practitioner as a carrier of multiple practices in multiple contexts is different. Practices are bundled together, but the practitioner does not choose to partake in these bundles. This has implications especially for consumer studies, as the strong entity of the subject is broke down into smaller pieces. However, practitioners are not dupes, but rather are active doers: practices are "dynamic by virtue of their own internal logic of operation, as people in myriad situations adapt, improvise and experiment" (Warde, 2005: 141). Wilk (2002, 2009) has explicated this by drawing attention to the dynamic interplay between habitus and praxis, where processes of naturalisation and cultivation describe the taken-for-grantedness in everyday life on one hand, and reflective thoughts and questioning of current practice on the other.

This given, the terms practitioner, dweller, user, resident, occupant, household, householder, citizen, consumer, and observant are used rather loosely throughout the text. This diversity of notions partly reflects practice theoretical attempts to not overly 'constrain' the practitioner and his or her agency in a specific domain of practical activity such as consumption (consumer) or political action (citizen). Choosing one term over the other in different occasions, however, enables these domains to be hinted at.

2.3.2 Organisation of practice

The elemental understanding of practice

The many definitions and conceptualizations of 'practice', 'practices', 'social practice', 'praxis', and 'praxeology' are easily confusing. As Reckwitz (2012) notes, the grammar is not established, but overlapping concepts are used. With the definition of practice, many scholars refer to the one summarised by Reckwitz (2002a), where the emphasis is on the interconnectedness of elements:

> A 'practice' (Praktik) is a routinised type of behaviour which consists of several elements, interconnected to one another: forms of bodily activities, forms of mental activities, 'things' and their use, background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge. A practice – a way of cooking, of consuming, or working, of investigating, of taking care of oneself or of others, etc. – forms so to speak a 'block' whose existence necessarily depends on the existence and specific interconnectedness of these elements, and which cannot be reduced to any one of those single elements. (Reckwitz 2002a: 249–250)

This definition clearly states that practices consist of interconnected elements: forms of bodily activities, forms of mental activities, things and their use, background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge. Shove et al. (2012) simplify this list by

denoting practices as consisting of meanings, competences and materials – elements that have linked with each other in new ways and formed new practices (Shove et al., 2012). This understanding of the elemental nature of practices has been important when moving away from the individual or structural analysis. Meanings, for Shove et al. (2012) refer to symbolic meanings, ideas and aspirations, such as the value of focal points of heat; competence refers to skills, know-how and technique, such as the ability to manage radiators and other technologies for heat provision; and things refer to objects, technologies, tangible physical entities, and the stuff of which objects are made (Shove et al., 2012). The dynamics of practices evolve as these elements are linked, unlinked and delinked over time, and as new people are recruited to perform the practice.

Social practices also can be seen as forming a "temporally unfolding and spatially dispersed nexus of doings and sayings" (Schatzki, 1996: 89), where the emphasis is not so strongly on connected elements, but rather on spatiotemporal manifolds. These manifolds of doings and sayings, however, 'hang' together through practical and general understandings, rules, and a teleoaffective structure (Schatzki, 2002). Practical understandings refer to certain abilities that pertain to the actions composing a practice: knowing how to X, knowing how to identify X-ings, and knowing how to prompt as well as respond to X-ings (Schatzki, 2002). General understandings are not unique to a practice, but include practitioners' understandings of themselves, or work or religion, for example. Sets of rules, on the other hand, refer to "explicit formulations, principles, precepts, and instructions that enjoin, direct, or remonstrate people to perform specific actions" (Schatzki, 2002). *A* teleoaffective structure, in turn, is a range of normativized and hierarchically ordered ends, and projects allied with normativized emotions and even moods: a practice always exhibits a set of ends that participants should or may pursue, a range of projects that they should or may carry out for the sake of these ends, and a selection of tasks that they should or may perform for the sake of those projects (Schatzki, 2002). This teleoaffective structure is indefinitely complex, and unevenly distributed into different actors' minds and actions (Schatzki, 2002). The activities that compose practices are inevitably, and often essentially, bound up with material entities, as basic doings and sayings, for example, are carried out by bodily activity (Schatzki, 2012). For Schatzki, material arrangements 'bundle' with practices, but are not part of them in a constitutive manner.

This understanding of practice is different to that of Shove and colleagues. The elementary approach has been seen useful in guiding empirical inquiries, in particular mapping out practices as entities. What is worth being cautious about is not oversimplifying practice, or letting a predefined idea of practice overrule the empirical analysis. Now it is sufficient to proceed by denoting practices as recognizable entities with a teleological structure (goal and aim) consisting of elements that are linked over time and space and carried by more or less devoted practitioners. These practices are organised in time and space, which is a topic of the following section.

Tracing practices in time and space

As outlined above, a key feature of practice theories is that practices are seen as doings, which have some form of organisation that goes beyond individuals. Practices are not considered as discrete, intentional, and situated acts carried out by individual agents, but rather as recurring, spreading and evolving patterns that carry their agents and are at the same time carried (out) by them (Reckwitz, 2012). Practices are an organised collection of different peoples' activities, which means that practices are spread out in time and space, and are not to be taken as microphenomena (Schatzki, 2012: 13). Practices without sharing are habits, and practices without reproduction can be seen as plain activities. Furthermore, practices are also open-ended in the sense that they are not composed of any particular number of activities (Schatzki, 2002). Doings and sayings belong to a given practice when they express some of the understandings, teleoaffective components and rules that make up the organization of that practice. It entails that the temporal structure of practice is open – unfolding – which leaves space for new actions to perpetuate (Schatzki, 2002).

How then can we identify a practice and its boundaries? One useful way to distinguish between different practices is to classify them as dispersed or integrative practices (Schatzki, 1996; Warde, 2005). 'Dispersed practices' such as describing, following rules, explaining and imagining appear in many sectors of social life (Schatzki, 1996: 91–92). A dispersed practice such as hand shaking includes timing, an etiquette of grasping and shaking, an understanding of one's own actions as part of an interaction, and the institution of relations among participants (Schatzki, 2010a). It is about understanding, responding to and 'knowing how to' do something, a capacity that presupposes a shared and collective practice involving performance in appropriate contexts and mastery of common understandings, which are the grounds for a particular act being recognizable (Warde, 2005: 135).

'Integrative practices' are practices found in and constitutive of particular domains of social life (Schatzki, 1996: 98). These include, sometimes in specialized forms, dispersed practices, which are part of the components of saying and doing that allow the understanding of, say, cooking practice, along with the ability to follow the rules governing the practice and its particular 'teleoaffective structure'. Integrative practices are generally of more interest to sociologists and particularly for the sociology of consumption (Warde, 2005: 135), and their role appears more central for those interested in how materiality constitutes practices.

The existence of an integrative practice might be recognised in that an instruction manual could be written, the activity could be included in a time-use survey, that there are, or could be, disputes with fellow participants about the standards of the performances, or finally, suites of specialised equipment devoted to an activity could be identified (Warde, 2014: 291). More generally, understanding people's words for activities and practices thus provides one with access to the activities and practices that make up the practice-arrangement bundles (Schatzki, 2012).

To say that practices form a temporally unfolding and spatially dispersed nexus of doings and sayings is to acknowledge how they enact in and over time and space. The analytical distinction between practice-as-entity and practice-as-performance helps to distinguish the totality of practice as an entity and as an enactment (Schatzki, 1996; Shove et al., 2012). Practice as an entity refers to a recognizable conjunction of elements – something that can be spoken about and draws upon a set of resources (Shove et al., 2012), and is formed as a collective achievement. Practice-as-entity only exists and endures because of recurrent enactments, or performances.

Practice-as-performance refers to the active carrying out of practices, and it is through performances that practitioners reproduce and transform the entities over time: "It is through performance, through the immediacy of doing, that the 'pattern' provided by the practice-as-an-entity is filled out and reproduced. It is only through successive moments of performance that the interdependencies between elements which constitute the practice as entity are sustained over time." (Shove et al., 2012: 7). Taken together, practices are thus coordinated entities that require performance for their existence (Warde, 2005). The distinction between a practice and its performances is especially important, when describing and making distinctions between practices. Every performance of a practice is singular and particular, and yet, it is essential to be able to determine whether any such given performance truly belongs to the category of given practice (Warde, 2013: 20).

On the one hand, there is a call to focus on the performance and entities of practices (such as heating) in their own right (Warde, 2005), but on the other hand, there is a call to draw attention to how certain practices enable or constrain others. These questions can also be brought together when thinking that practice is recognisable through its performance but judgement of their correctness cannot with reference to a single (integrative) practice (Warde, 2013). Indeed, practices link to other practices through bundles, which form constellations, and finally a large plenum of linked practices and arrangements (Schatzki, 2014), but how practices affect other practices is less theorised. For Shove et al. (2012), bundles of practices are formed by practices that are co-located in space and time, and which co-exist in the form of a loose knit. Such bundles can become co-dependent and form stickier complexes in which the performance of any one practice depends on the performance of others (see also Shove et al., 2015). To a large extent, however, it seems that practices also affect each other through normativity, as the organisation of practices is what is prescribed, appropriate and acceptable (Warde, 2013). These analytical distinctions are needed as we further unravel the material and temporal dynamics of practices.

Temporal organisation of practice

As the unfolding nature of practices suggests, the question of temporality is central in how practices are organised. Temporality as a theme in social analysis would deserve a lengthy introduction but for this theoretical overview it is worth pointing to some of the most central discussions on temporality in theories of practice.

It is well recognised that practices come with their own requirements and demands, and that performing practices means adopting their temporal injunctions (Southerton, 2006: 440; Shove et al., 2012). Seeing practices as entities that have time demands adds an important (political) dimension to the relations between practices, for as practitioners' time is a limited, finite resource, its allocation reflects the relative dominance of some practices over others (Shove et al., 2012: 127). What these demands are, in terms material-temporal engagements, has strong consequences for the palette of practices. For example, technology can in some instances be seen as creating more time for consumption (Southerton, 2003), but the effect can also be counter wise (Cowan, 1983).

Drawing from Fine (1990), Southerton (2006) has proposed that social practices operate along five dimensions of time: tempo (rate or speed), duration (length), timing (synchronisation), sequences (ordering of events) and periodicity (rhythm). For example, in constituting the social, fixed rhythms make daily life more predictable and manageable (Southerton, 2006). Practices thus compete for time, but they also overlap and synchronise forming "subtle forms of symbiosis" (Shove et al., 2012: 128, see also Jalas & Rinkinen, 2013). While the notion that practices are competitors within the timespace of activities entails that performances of practices demand time and space, overlapping and synchronising of practices, on the other hand, show how practices as entities are carried out within complexes of different practices, systems and orders.

More broadly, understanding the changing socio-temporal organisation of daily practices contributes to move away from straightforwardly causal explanations of social change (Southerton, 2003). Even though time and the temporal organisation of daily practices have been subject to attention (Southerton, 2003; Jalas, 2005; Southerton, 2006; Shove et al., 2009), the relationship between the co-constitution of temporality and materiality is less well articulated.

2.4 Things and theories of social practice

2.4.1 Materiality and contemporary social thought

Issues of matter, things and materiality are widely discussed across social sciences, and many scholars have recently demanded a stronger role for the material in social analysis. This call for emphasising materiality is welcomed, considering that physicality and nature, for example, were considered mostly irrelevant to social phenomena, and merely seen as background conditions against which social affairs proceed. The decade-long dominant practice in social thought, above all in sociology, was to theorize society as if materiality did not matter (Schatzki, 2010b).

For example, the cultural turn finds little place for objects and technologies as material forces. Rather, cultural theories such as naturalism and utilitarianism understand human action and social order by establishing symbolic codes and schemes that regulate meaning and have favoured the 'ideal' as opposed to the 'real', and 'idealism' as opposed to 'materialism', reflecting the classical dualism

of modern thought (Reckwitz, 2002b). It has followed, as Reckwitz (2002b) contends, that material functions as something added to an already complete culture.

One of the starting points for social scientific interest in materiality was the concern over the power dynamics between humans and non-humans, and how they comply with each other in a complex web of interrelations (Callon, 1986). These concerns represent a form of 'post-sociality', which calls for greater emphasis on understanding the mutual constitution of the material and the social, and points towards material encounters by which humans engage with objects in an intimate or collegial way and constitute themselves mutually (Latour, 1994; 2005; Law & Mol, 1995; Law, 1999; Knorr Cetina, 1997; Orlikowski, 2007). Latour's (2005) prominent actor-network theory has contributed an influential non-modernist approach that recognises the links between the cultural and the material in a way that goes beyond the idea of 'constitution' in one way or another. Studying these intertwinements of human and technological worlds potentially establishes a strong political momentum in questioning the power dynamics in technologically mediated societies (Haraway, 2013).

An ample of research fields has evolved from interest in the role of materiality. For instance, innovation studies, science and technology studies, and their interfaces (Berkhout, 2000; Geels, 2002; Rip & Kemp, 1998), have tackled questions revolving around technological regimes, and further, studies on consumption, material culture and anthropology (Miller, 1998; Highmore, 2002; Ingold, 2000; Marres, 2012) all permeate to the material domain of everyday life, and yield insights into the understanding of consumer goods, the roles of artefacts, and politics of matter (see Figure 1).

In relation to this turn to the material, theories of practice have been suggested to be helpful in seeking a balanced understanding of materiality in social analysis and in overcoming sociology's own theoretical unease with technology and the physical and natural worlds (see e.g. Wilhite, 2008; Spaargaren, 2011; Shove et al., 2012). Whereas much inspiration has been drawn from debates on materiality, especially in science and technology studies, many of the practice theoretical ideas are apart from them. For example, actor-network theory has been critiqued for not appreciating and conceptualizing the 'doings' that are carried out in networks. Schatzki (2010b) notes that while materiality is given agency in the networks, actor-network theory says little – or nothing – about practices. Socio-material perspectives, in turn, consider people's actions to be always locally emergent, situated and defined, and embedded within material as well as social processes and structures (Orlikowski, 2007; Clegg et al., 2012), and this focus on organizational dynamics underplays the capacity of the approaches to conceptualise broader social changes. Shove et al. (2012) also argue that in post-social approaches (e.g. Knorr Cetina, 1997; Law, 1999), the burden placed on materiality may be too heavy. Furthermore, material culture studies often focus on identities and end results, or the symbolic surfaces of objects rather than on the physical involvement of objects, for instance, in the tasks and projects of doing-it-yourself (Shove et al., 2007).

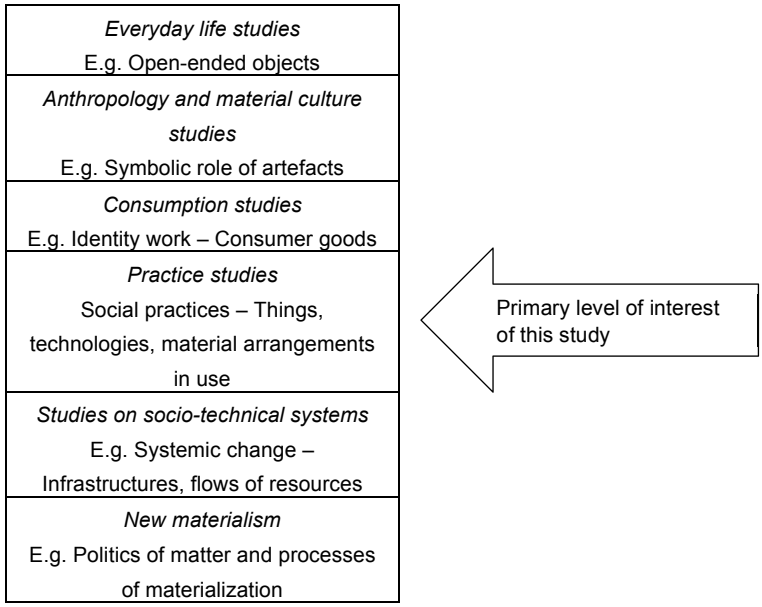

Figure 1. The level of interest of this study compared with those dominant in related fields.

2.4.2 Materiality in and for practices

Everyday, aesthetics and materiality

The increasing interest in materiality can also be seen as an implication of the stronger appreciation of everyday knowledge and practicality in cultural theories (e.g. Gardiner, 2006; Turkle, 2011, Ingold, 2012). It is now more and more widely acknowledged that one of the prevailing relationships between human agents and material things is a relationship of practical understanding, and that the practical nature of everyday life is carried out through doings with things. Following Heidegger, the very essence of everydayness transpires in a set of skills for coping with the world and creating and manipulating material equipment (Heidegger, 1996). It follows that knowledge of the world is a derivative of the everyday practice, and primarily developed in the process of coping with everyday life (Gosden, 1994). Sensemaking and knowing are also located in the material and discursive activities, bodies, artefacts, habits and preoccupations that populate the life of practitioners (Orr, 1996; Nicolini, 2012).

Everyday objects explain routines and expectations of life, and reinforce the basic beliefs about the natural order of the world. For Miller, material culture matters because objects create subjects:

> the less we are aware of them [objects], the more powerfully they can determine our expectations, by setting the scene and ensuring appropriate behavior, without being open to challenge. They determine what takes place to the extent that we are unconscious of their capacity to do so. (Miller, 2005: 5)

In this sense, everyday and its objects become aesthetic and something that gives order, balance and harmony to the world people live in (Miller, 2008). Aesthetics thus is not merely about 'value', but it is about foregrounding form and privileging the patterning of experience. In this aesthetic patterning of experience there is also a strong link to temporality, as recognised in Lefebrve's work on rhythmanalysis: "Rhythmanalysis is a socio-aesthetic approach because it suggests forms for grasping the experiential actuality of the everyday in all its complexity, and because it prioritizes the material and biological body that is doing the experiencing" (Highmore, 2004: 325).

For material culture scholars, things are *lived with* and *dwelled with*. Material culture scholars further propose that objects provide the setting that makes us aware of what is appropriate and inappropriate (Miller, 2010), as well as of the intertwinements of usefulness and aesthetics (Turkle, 2011). While practice theories do acknowledge that materiality acts as a medium of storage for meanings and competences and the circulation of elements of practice (Shove et al., 2012), they largely focus on hardware in use. As compared to ideas of material culture scholars, for practice scholars, objects are not primarily lived with but done with and acted with.

The constitutive role of things

Things and material arrangements have received a central role in theories of social practice, not as a prevailing locus of research but as a constitutive element of practice (Reckwitz, 2002; 2002b; Shove et al., 2012) or as part of the practice arrangements (Schatzki, 2010b). Notably, theories of social practice propose a shift from studying the 'surface' of objects as expressed by their cultural meanings to emphasizing the role objects have in the processes of emerging, carrying out and reproducing practices; materials have a role beyond being an object of knowledge (Shove et al., 2012). The social significance of things does not only lie in the interpretations, but also in the ways they are 'handled' and how they form constitutive, effective elements of social practices (Reckwitz, 2002b; Shove et al., 2012). Accordingly, practices in their historical variability consist not only of human beings and their intersubjective relationships, but also simultaneously of non-human actants, things that are necessary components of a social practice (Reckwitz, 2002b).

Things, as seen by Shove et al. (2012), refer to objects, technologies, infrastructures, tools and the body, whereas material arrangements are a set of interconnected material entities consisting of humans, artefacts, organisms, and things of nature (Schatzki, 2010b). So far, theories of social practice have been good at attending to the use of things and the role things play in constituting practices. Studies on consumption, in particular, have embraced the idea that consumption happens for the sake of practices, thus pushing the ontological status of the consumption of goods towards being an integrated element in practice.

> Items consumed are put to use in the course of engaging in particular practices like motoring and being a competent practitioner requires appropriate consumption of goods and services. The practice, so to speak, requires that competent practitioners will avail themselves of the requisite services, possess and command the capability

> to manipulate the appropriate tools, and devote a suitable level of attention to the conduct of the practice. (Warde, 2005: 145)

As the quote by Warde shows, consumption is partly about how to 'manipulate the appropriate tools'. Recent studies explicitly focusing on the attendance to specific objects have discussed a variety of forms of object engagement such as object maintenance (Gregson et al., 2009) and do-it-yourself practices (Watson & Shove, 2008). These have not only shown the dynamic status of material objects in daily life, but have also provided insights into the different and changing roles materials play in practices, and have thus expanded our view of consumption.

For Shove et al. (2012), the social handling of materiality and its role in constituting practices is of interest, while the distinctions between different materialities has not been a central interest. Shove et al. (2012: 121) reflect on this by stating that "We have classified cast-iron stoves, skateboards, ink, infrastructure, bicycles and wing-mirrors as material elements as and when it suits us, paying little or no attention to their different and distinctive qualities." Consequently, materiality is often defined through its role in practices as a distinctive, traceable gathering of materials. It seems that considering materiality in practice theoretical approaches to the sociology of consumption has entailed some strong simplifications.

Material arrangements

Material arrangements, as conceptualised by Schatzki (2010b), is a broader concept, referring to those arrangements amid which practices transpire. They are co-dependent and yet ultimately distinguishable from practice itself. In Schatzki's accounts, material arrangements refer to a set of interconnected material entities:

> Whenever someone acts and therewith carries on a practice, she does so in a setting that is composed of material entities. The material arrangements amid which humans carry on embrace four types of entity: human beings, artefacts, other organisms, and things. (Schatzki, 2005: 471)

> […] most practices would not exist without materialities of the sorts they deal with, just as most material arrangements that practices deal with would not exist in the absence of these practices. Because the relationship between practices and material entities is so intimate, I believe that the notion of a bundle of practices and material arrangements is fundamental to analyzing human life. (Schatzki, 2012: 16)

Being interested in how theories of human sociality can and should account for materiality, Schatzki argues that human coexistence is inherently tied, not just to practices, but also to material arrangements that are not a constitutive part of practices. For Schatzki (2005: 471), the site of the social is composed of nexuses of practices *and* material arrangements.

Schatzki's so-called site ontology recognizes that any thing, property or event can be at once both social and material-natural: something is social if it is part of the nexus of practices and arrangements, as part of which human coexistence inherently transpires, and something is material if it is physical, biological or

natural (Schatzki, 2010b). It follows that any material entity that is an element of the arrangements as part of which human coexistence transpires is also at once a social entity. More expansively, any entity at all can in theory be both social and material-natural. Schatzki's account consequently declines to talk of interactions, exchanges or a dialectical relationship between society and nature, as has been the dominant way, for instance, in interactionism (see Schatzki, 2010b).

Hence, there is a basic ontological difference in positioning and defining materiality either as constitutive of practices, or as material arrangements that together with practices bundle and constitute the site of the social. The classification of practice elements in meanings, skills and materialities is helpful in understanding what it takes to accomplish a practice at a given moment and place, and how practices emerge, develop and die (Shove et al., 2012). This approach of seeing things as constitutive elements of practice advances the view that individual technologies add value only to the extent that they are assembled together into effective configurations (Suchman et al., 1999).

However, it has recently been increasingly stressed that the analysis of the role of materials should not stop there (Shove et al., 2015), and interestingly, this distinctions has been recently narrowed in practice theoretical concerns of conceptualising energy:

> Since 'material arrangements are in some sense crystallisations of matter-energy flows' (Schatzki, 2010: 137), sources of energy – wood, coal, oil, etc. – along with technologies of conversion and use (stoves, boilers, cars, etc.) qualify as part of such arrangements, but they do so only in relation to specific practices. (Shove & Walker, 2014).

For example, infrastructures as materially dispersed arrangements provide the structure through which things such as people, resources, goods, competences, ideas, meanings and services flow, and as a concept it further expands and challenges the idea of materiality of practices (Shove et al., 2015).

Materiality as connector: Scripts, tools and flows

Besides the challenge of positioning materiality in relation to practices, the power of things in sculpting and governing practices is a central concern. Script has been widely used as a concept for thinking about how the behaviour of actors is built into the artefact (Law & Bijker, 1992), but also, how objects "script" practices (Shove et al., 2012). Technologies are scripted with a set of dispositions that have the potential to shape practices, and in turn be shaped by practices beyond what was originally planned in the phase of designing technology. Hence, even though script may suggest a rather deterministic understanding of technology use, from a practice theoretical viewpoint, technologies are not context-neutral solutions that yield convenience, but rather exhibit forms of agency that open towards new and often unanticipated practices (Akrich, 1992).

According to Akrich (1992), technologies lead to new mutual dispositions between people and things, and new forms of knowledge about the world. New materials or forms of knowledge can disrupt existing routines and throw

established habits out of kilter (Certeau, 1984). It is also evident that while some mundane acts of doing are full of certainty, others are riddled with uncertainty, also reporting on strains, tensions and outright conflict about how things should be done (Rinkinen et al., 2015). Tactical ways of doing and coping do not always correspond to shared understandings of how objects should be handled and lived with. Hence, there is tension between the improvised, unanticipated everyday life and shared social practices. These challenges underpin the material dynamics of practice.

The power of materiality to script practices can be very different. Some material arrangements such as road infrastructures or electricity networks aim at an enabling role in everyday life: when functioning, they are taken for granted, even invisible and continuously available. Tools, on the other hand, are efficient in coordinating as their scripts suggest ways of doing, and their use requires bodily and mental involvement. Tools suggest very local, reasonable acts of doing, which differ from moment to moment. In many practices, different materials come together.

As practices unfold over time, materiality is seen to bring out stability and frequency, as it both participates in the entity of practice and makes its performance durable over time. Knowledge, meaning, materiality and action are more than localised configurations, and actions, intentions, projects and ends are both tied to and altered in response to the flow of events that results from the intertwining of human doings with material ones (Schatzki, 2002: 109). It follows that actions, intentions and ends are never stable; nor are the material arrangements. The different ways in which materiality relates to practice arrangements can be characterised as as biological entities that compose arrangements, which together with practices compose social sites; as compositions that affect the course of practices by rendering combinations and sequences; and as flows that pass through practice-arrangement nexuses (Schatzki, 2010b). When practices are enacted as performances, the importance of looking beyond specific moments of integration is highlighted.

Thus, 'things' become part of hybrid arrangements: concretions, settings and flows (Thrift, 2008). To some extent, this has been reflected in the interest of sociology and environmental sciences in flows, especially concerning questions around climate change and technological modernisation (Urry, 2000; Mol & Spaargaren, 2006). 'Space of flows' has been argued to represent a new kind of time-space organization of social practices (Mol & Spaargaren, 2006). For example, the megacities can no longer be assessed as geographical areas but as "nodal points of global economic, cultural and political networks" (Castells, 1996 as cited in Mol & Spaargaren, 2006). The space of flows refers to the material support given simultaneously to a number of social practices (Mol & Spaargaren, 2006). While the long and eminent history of theorizing resource flows can be traced down to studies on ecological economics, industrial ecology, ecosystem services and lifecycle analysis (see e.g. Daly & Farley, 2011), these studies, as Mol and Spaargaren (2006) note, pay little or no attention to social systems and social networks themselves, such as the social interactions and dynamics, the

power relations governing these material flows, or the non-material flows that parallel these material and energy flows.

2.4.3 The 'ecology' of materials

Ingold's (2012) ideas on the differences in understanding materiality (see Table 1) can be used to think harder on the positioning of materiality in relation to practices. He is an anthropologist, who has explored, for example, the relationships between skilled practice and the use of tools.

Objects, in Ingold's (2012) view, are defined as individual relations, in particular through the relation *of* perceiver *to* the completed forms. Objects are completed forms that stand over and against the perceiver and block further movement. *Things*, on the other hand, refer to a more performative understanding of gatherings of materials in movement. *Materials*, again, refer to matter considered in respect to its occurrence in processes of flow and transformation (Ingold, 2012). *Materiality* is both the 'brute' materiality and also the ways in which the material world is appropriate in human processes.

These can be considered as important distinctions for practice theoretical inquiries, where the interest is in how material things relate to practice and less in how practitioners relate to material things. For example, to see materials as only referring to objects that are made rather than those of nature is contradictory to Ingold's (2012) conceptualisation of materiality as referring to the "brute materiality" of the physical world, but also to the ways the physical world is appropriated in human projects. These nuances between definitions might seem small, but they bear significance when thinking about the multiple objects and material relations and engagement within and between practices.

As this theoretical review reveals, the challenge of practice theory is to account for the different characteristics, constellations, processes, and connections of all the 'things' that go under the vague notion of materiality. To underline and overcome some of the challenges, Ingold (2012) brings forth the notion of ecology of materials, which focuses on materiality's enrolment in form-making processes: he advises material culture studies to make a turn from the "objectness" of things to the material flows and formative processes wherein they come into being. From this view, in a world of materials, nothing is ever finished: "everything may be something, but being something is always on the way to becoming something else" (Ingold, 2011: 3). Materials are substances-in-becoming, as they carry on and overtake the formal destinations that, at one time or another, have been assigned to them (Barad, 2003). Every thing is a gathering of materials in movement – a particular knotting together of the matter-flow – and to witness a thing is to join with the processes of its ongoing formation (Heidegger, 1996).

Table 1. Key concepts of materiality (Ingold, 2012 and when otherwise mentioned, Schatzki, 2003, 2010).

Artefacts	Objects thought to be made rather than grown
Body	A dynamic centre of unfolding activity, rather than a sink into which practices are sedimented
Materiality	(A) The "brute materiality" of the physical world; (B) The ways this world is appropriated in human projects
Materials	Matter considered in respect of its occurrence in processes of flow and transformation
Material arrangements	Interconnected material entities (humans, artefacts, organisms, and things of nature) (Schatzki, 2010)
Non-humans	Often used as an alternative for "made objects" or "artefacts"; nonhumans should also include living organisms of all kinds
Objects	Completed forms that stand over and against the perceiver and block further movement
Things	Gatherings of materials in movement, as distinct from objects
Technologies	(A) Machines, artefacts and techniques, as well as technical knowledge and skill, and the means for furthering ends (instrumental view); (B) A certain range of objects, material objects more specifically, as opposed to a certain form of activity, knowledge or will (Schatzki, 2003)

To some extent, these processes of becoming are recognised in capturing the emergence and disappearance of practices (e.g. Shove & Pantzar, 2005). However, it is easy to side with Ingold's (2012) review, which reveals that the recent trends emphasize, first, a conception of the material world and the nonhuman that leaves no space for living organisms; second, an understanding of materiality that prioritizes finished artefacts over the properties of materials; and third, a conflation of things with objects that stops up the flows of energy and circulations of materials on which life depends. Furthermore, questions concerning the status of materials when not attached to other elements are important in accounting for the role of materials in social change.

Against this, materiality is adopted as a broad concept to refer to both the brute materiality, and its appropriation (as things, objects, materials, technologies, artefacts) in practices. The term materiality is used to implicate material arrangements and material elements of practice. There is an empirical reason for this. To some extent, the practices of wood heating do conceptualise under the notions of "connective", "extensive", "collective" and "obdurate" infrastructures (Shove et al., 2015), but nevertheless the notion of infrastructure does not grasp or do justice to the great variation in the local material configurations of small-scale wood heating. Hence, for the understanding of the

role of energy, it makes sense to distinguish practices and material arrangements, as recently acknowledged by Shove and Walker (2014). Practices are constitutively material, but some material arrangements such as electricity and information networks, road infrastructure, and houses, are more complex and enable and support multiple practices at once. The notion of things or material elements fails to grasp this dispersed support and hence is insufficient in accounting for the role of materiality in the intersection of multiple practices.

2.5 Summarising synthesis

This theoretical discussion is informed by the theoretical research problem of this thesis, which explores the material and temporal dynamics of the everyday practice of social practices. For this task, the understanding of how practices are organised in time and space as entities and performances and how materials both constitute practices and are parts of material arrangements is relevant.

It was discovered that an important task for practice scholars is to explicate and differentiate between the many concepts and definitions that go under the vague term of materiality. The term materiality was adopted as a broad concept to refer to both the brute materiality and its appropriation (as things, objects, materials, technologies, artefacts) in practices, and on empirical grounds the term materiality is used to implicate both the role of material arrangements and that of material elements.

It is evident that the presented theoretical review of materiality is limited. However, it is useful in pointing out that questions such as the role of the objects in dormancy, or when they are not attached to practices, as well as their flexibility are not frequently touched upon, and neither is materiality as objects of desire and beliefs. The conceptualisation of materiality in theories of practice is largely pragmatic. Moreover, in order to fully account for sustainable practices, it is required that practice theoretical accounts are sensitive to the material processes and properties within and outside practices. For example, the concept of technology in social analysis easily overlooks the material resources that the reproduction of practices calls for. The living environment is an increasingly artefactual setting, and technologies that constitute practices have different non-human material properties, processes and requirements (Schatzki, 2003). Material processes such as decay and changing ecosystems can be slow, and material properties may be difficult to perceive. For example, when heating with wood, the central material element is wood, which is relatively visible, known and actionable for the wood heater. For many other consumer goods, their material elements appear as more complex and hidden.

The argument so far is that the definition of materiality is not one-directional, nor should it be forced to be one. Rather, to a large extent, defining and 'drawing lines' for practices and their constitution is an empirical matter, something that should not be limited by predefined theoretical concepts. It is now intriguing to turn to the recent advances in empirical studies around energy and heating, and explore how this understanding of practice plays out in the recent practice of social science. The specification of the role of materiality, especially in relation to

questions of energy use, is continued in the following chapter, which reviews studies that conceptualise heating and other energy-intensive activities from a practice theoretical viewpoint.

3. Keeping warm: Practice theoretical understandings of heating

Traditionally, energy has not been at the centre of social analysis, but rather a topic that has been commonly approached with technical, physical and economic terms. However, detailed histories of energy use forcefully emphasise the social impacts in and around energy use, and reveal the central role of energy in shaping societies and social practices (Nye, 1999). Energy in all its multiplicity has an undisputed role in shaping societies and social practices (Illich, 1974; Caldwell, 1976), and it is increasingly recognised as a defect that social science methods and tools have been largely missing in the academic debates on energy (e.g. Guy & Shove, 2000; Sovacool, 2014). Against this, there has been an explicit call for researchers to explore and integrate concepts from social sciences more boldly (Lutzenhiser, 1993; Guy & Shove, 2000; Gram-Hanssen, 2011; Gross & Mautz, 2014; Shove & Walker, 2014; Sovacool, 2014).

This chapter provides a selective review of the recent studies on energy use and domestic heating, and underlines that from a practice theoretical perspective, heating and staying warm span beyond technological and economic questions. The aim of this review is, first, to explicate how theories of social practice have approached the dynamics of energy use and heating, and second, to overcome some of the challenges of defining heating as practice.

This section firstly discusses how heating is considered as service provision, particularly providing services of thermal comfort. This represents one of the strongest arguments of practice theories, where the attention is steered to what *energy is used for* rather than to what energy use is. Second, another stream of studies is presented that delve into the different engagements with heat, such as dwelling with technology, working for heat, and affective and bodily engagements involved. Third, the chapter introduces the practice of wood heating. Two of the thesis papers briefly describe the technical and social aspects of solid wood-based heating (Jalas & Rinkinen, 2013; Rinkinen, 2013), but this section complements this account by drawing more detailed attention to aspects of sensory engagement, convenience and meanings, all of which are considered relevant issues in practice theoretical accounts to energy use. Taken together, this review portrays wood heating as a dynamic achievement rather than as a static arrangement, and helps think deeper about the ways heating and energy use play out in studies on energy use.

3.1 Converging comfort

Shove (2003) has argued that when using energy, we ultimately produce and consume various services. Many of these services signify comfort and convenience, such as those around hygiene or heat. 'Thermal comfort', in particular, has been brought to attention as a new way to conceptualise energy-related practices and technologies in the domestic sphere.

Thermal comfort as a notion can bridge layers of technology of human encasements, since clothing, housing and the natural environment form an integrated practical unity against which the needs of the human body are negotiated (Hitchings & Lee, 2008). Aside from its very materialised definition, it also refers to a contextual and dynamic achievement of managing temperatures, and also to an increasingly scripted and standardised convention with clear implications for resource use (Shove, 2003; Hitchings, 2009). For instance, research on thermal comfort has importantly drawn attention to the emergence of mechanical cooling, which is increasing at an enormous pace and has enormous consequences for energy demand (e.g. Shove, 2003; Chappels & Shove, 2005; Hitchings & Lee, 2008; Strengers, 2008). This understanding of comfort as a dynamic and contextual achievement is very different from the dominant techno-economic understanding, where comfort is seen as a condition that is definable and established as universal standards for the indoor environment (Shove, 2003). Moreover, keeping warm and managing heat flows at home unfolds as a skill and an achievement that builds on dynamic – as opposed to static and standardized – knowhow (Royston, 2014). It has been proposed that understanding domestic thermal practices and conventions is important in pushing forward new or stabilising the current energy norms at home in pursuit of sustainability (Shove, 2003; Chappells & Shove, 2005; Hitchings & Day, 2011).

A central question in understanding comfort and convenience and active and passive usership seems to be one of whether people should be provided with a relatively standardized immediate environment through the provision of conditioned air or be encouraged to exercise their individual powers of adaptation (Shove, 2003; Hitchings, 2011). Energy efficient houses are designed and built under the influence of building regulations, and many significant advances have been made in the insulation, ventilation and composition of houses aiming at a more 'healthy' and resource-efficient building stock. However, as a consequence, many of the practices of the building sector have led to a homogenised building stock, and raised concerns that we are stuck with unhealthy – socially, economically and ecologically unsustainable – houses. And importantly, such regulations contribute to a unified demand for comfort that leads to increasing dependence on resources (Shove, 2003).

If we took comfort as adaptable, negotiable and socio-cultural as opposed to a universal construct we would aim at designs that offer people a wider variety of ways to achieve thermal comfort (Chappells & Shove, 2005; Kuijer & de Jong, 2012). Also, whereas technologies may be planned to promote sustainable forms of energy provision and include closed scripts and normative ways of their use, the ways technologies are embedded in the heating arrangements and how

residents encounter and make use of them vary (Cowan, 1983; Shove et al., 2007). Critics of standardization argue that the "technology of heating and cooling aims [...] to achieve a thermal 'steady-state' across time and a thermal equilibrium across space," and a standard indoor temperature consequently deprives the diversity of dwelling experience (Heschong, 1979).

It follows that a central claim of practice scholars is that standards should be assessed beyond the physical environment to include social dimensions and the standards of doing, and that the use of technologies may not only lead to new arrangements of people and things, but they may, in addition, generate and 'normalize' new forms and orders of causality (Shove & Southerton, 2000; Schatzki, 2002).

3.2 Engaging with heat

3.2.1 Modes of provision and the question of work

Heating, in technical terms, is a conversion of energy resources to provide heat services that are integral to the ongoing performance and reproduction of social practice similarly to the services of lighting and mobility (Walker, 2014: 50). "The demand for energy is from this perspective a secondary outcome of demands for energy services, which are in turn a consequence of how everyday practices are constituted and performed" (Walker, 2014: 50). Energy demand is an outcome of energy use and energy is an 'ingredient' of the doing or performing of social practices (Shove & Walker, 2014).

Analysing the patterning of energy demand therefore involves stepping back from energy itself, as well as going beyond just an interest in the efficiencies of the technologies through which energy is converted and utilised to provide energy services (Walker, 2014). However, whereas practice theory emphasises heat as service provision, heating itself is also practice, which is not merely a physical activity but also part of broader social life. In heating, energy is made usable for various services such as thermal comfort, but it also unfolds energy and heat as distinctive, manageable ingredients. Consequently, heating comes out as a bundle of practices of managing heat flows in different ways and following the seasonal variations.

Indeed, practice theory turns attention to the energy demanding practices and the services energy provides, but it should not be taken to be indifferent in terms of the modes of energy provision. The scope of provision modes is wide and all modes have distinctive and complex implications for users' roles, and the organisation of heating. In small-scale heating, the actual work or labour for heating does not happen in centralised factories but rather it is carried out by the end-user in different locales that need to be heated, such as homes, summer cottages and workshops. In other words, active, temporal heating work and management of heat flows goes on in people's homes, spiced up with instances where the sensory aspects of keeping warm may be even more relevant and active (Royston, 2014; Wallenborn & Wilhite, 2014). Infrastructures may solve some problems when they reduce the work of practitioners, but this

simultaneously liberates them for other tasks and as resource units in other modes of production.

The notion of 'hot' energy demonstrates that heat management can form a lively nexus of interrelated practices through which practitioners become deeply involved in radiating warmth throughout their homes (Vannini & Taggart, 2013). Moreover, Strengers and Maller (2012) suggest that the qualities of different energy systems define how energies are constituted and integrated into practice as a material 'thing' or 'things', and the demands and dependencies they make and create in practice. These confirm that sustainable forms of practices such as heating signify even more complex, decentralized arrangements of heat provision, where the role of the end user changes from a passive user to a more active and competent practitioner (Southerton et al., 2004; van Vliet et al., 2005; Juntunen, 2014).

The different modes of organising energy provision, described as autonomous, piecemeal, integrated or universal, revolve around distinctive representations of consumers' roles in provision, and managing demand (van Vliet et al., 2005). Thus, "energy does not only enter our everyday experience as a single, totalizing entity or phenomena – something vague and amorphous with which our only real concern is 'connecting to'" (Pierce & Paulos, 2010: 117).

Materiality, hence, is the proximity and visibility of resource systems in everyday life (Strengers & Maller, 2012: 755). This is all very true in terms of wood heating. Consequently, different systems of provision delimit the role of energy resources being incorporated as a material element of practices and potentially reducing household conservation and resourcefulness, which is a trait that emerges and is reproduced from direct experience and familiarity with resources (Strengers & Maller, 2012). By strongly coupling both the services that energy provides (heat) and the physicality of energy (work), elaborating such a varied practice of heating may help to overcome the researcher's dilemma that when energy is in the spotlight, the services it provides are in the shadow, and when services are highlighted, the energy dimensions fade (Shove, 1997: 271).

3.2.2 Houses, technologies, and dwellers

Technology as novelty

Recent trends in energy transitions strongly suggest that new technologies have been and will be introduced to the domestic sphere. The proliferation of new technologies such as ground source heat and other heat pump solutions, as well as the hype around solar technologies, stand out as recent examples of the development where the home is the new prevalent nexus of organising for energy provision (e.g. Heiskanen et al., 2011; Hyysalo et al., 2013; Heiskanen et al., 2014). The processes of technology proliferation are widely recognised and researched, and form a research area of its own. For instance, it is acknowledged that the domestication of technology is a complex, non-linear process of integration (Silverstone & Haddon, 1996), and science and technology scholars point to the manifold ways in which technological changes puzzle, surprise and build expectations in social life with novelties and promises of them (Cowan, 1983; Borup et al., 2006).

Nevertheless, when harking back to the studies on domestic space heating, it seems that studies on the proliferation of new energy technologies often overlook the fact that novel technologies are based on backbone technologies and material arrangements, and fitted into the organisation of everyday life (see Jalas & Rinkinen, 2013). Recent studies seldom reach the level of routinization that emerges as technologies are gradually ingrained into the fabric of everyday life. It follows that even though the home as a site of diverse energy-related interventions is increasingly policy-relevant (e.g. Lovins, 1977; Aune, 2007; Gyberg & Palm, 2009; Hargreaves et al., 2010), only a limited number of empirical accounts have addressed the everydayness of energy-related socio-technical systems as taken-for-granted non-novelties. It may be further asked whether studies focusing on the new and the novel are concealing layers of action, materiality, meanings, or skills that are significant yet understated in exploring domestic energy use (Stephenson et al., 2010).

One explanation for the overriding focus on the novel is that technology optimists and energy behaviouralists have oversimplified the ways in which new technologies affect practices, and overlooked the new approaches which pay attention to the ways that energy demand is embedded in the material world (Wilhite, 2008). Against this, the view advocated by practice scholars that people and materials entwine and engage with each other through practices is welcomed for the analysis of energy transitions. Often, new technologies come in with dual tendencies: as Cowan (1983) describes, domestic technologies commonly have additional unexpected consequences, and even end up being more labour demanding than easing. Consequently, an abundance of studies have offered a vivid discussion on the challenges and dynamics new technologies bring about, and it is increasingly recognised that changes in heat provision affect the social organization of daily life, and the understanding of what is proper and normal (Shove, 2003).

Adaptation in the domestic sphere

Achieving substantial energy reductions requires ongoing monitoring of energy use and thereby a more intimate working knowledge of the house than has typically been required of the modern home dweller. More broadly, energy use is also tied into the rhythms of demand and patterns of daily living, and it is not only knowing about the house but also knowing how the house fits into and configures such patterns – again, something that is more than has typically been required of the modern dweller. This is to some extent acknowledged by actors who promote new technologies if their efforts arise from immediate practical considerations (Heiskanen et al., 2011). It is still worth further emphasis that rather than asking why and how energy renovations are made, questions exposing the co-existing and co-aligning systems for keeping warm need to be raised.

Given its technological nature, domestic space heating can be largely path dependent. One reason for this is the resistance of residents to the long payback periods of energy efficiency investments, and also the lack of credibility and legitimacy of new solutions caused by the insufficient understanding of users (Heiskanen et al., 2011). However, considering the multiple effects of heating

technologies, it is not surprising that the role of energy renovations and retrofits is seen as an increasingly relevant tool of successful climate policy, and a subject of interest in more practice-sensitive studies (Bartiaux et al., 2014; Maller et al., 2012; Karvonen, 2013; Gabriel & Watson, 2013; Gram-Hanssen, 2014). These studies have shown that heating technologies are seldom purchased as off-the-shelf products, but instead they are integrated in the ecosystem of the house, and adjusted and renewed over time. Even new installations such as supporting wood stoves or heat pumps need to be integrated by considering the design and properties of the house, which highlights the embedded and complex nature of heating arrangements.

Besides interest in how the practice of renovation is carried out, studies on retrofits further aim at exposing the complex nature of the social context of heating and the related know-how (Gabriel & Watson, 2013; Gram-Hanssen, 2014). For example, in studying the experiences of Australians installing solar hot water systems, Gabriel and Watson (2013: 220) found that sustainable home adaptation was not a straightforward process whereby occupant aspirations were delivered through building adaptation, but rather adaptation arose from the "differing capacities and practices of occupants and their buildings", and the ways these were negotiated over time. Successful adaptations were dependent on the integration of the occupant's 'folk knowledge' of their home along with the 'technical knowledge' provided by tradespeople, suppliers or the occupants themselves.

Heating systems can greatly affect the cost and convenience of living, even to the extent of fuel poverty (Middlemiss & Gillard, 2015). Despite this, there is little evidence that energy efficiency would rule as a sales argument in the real estate markets (Aune, 2012), and it persists that heating system is rarely a significant buying criterion in housing purchases, unlike the price, location, size or design of the house. It follows that dwellers frequently end up living with heating systems that they did not choose themselves, but often accumulate experience of a variety of different heating systems. As houses carry long histories of changing residents, people come across heating systems that have 'belonged' to someone else and thus have traces left by previous dwellers. People adapt to material conditions – often unconsciously (Cowan, 1983) – in a way that is rational to them in the given settings, but which can seem irrational in terms of cost, energy or time saving (e.g. Nicol, 2011).

This also evokes a question on the role of the house as an element of practice. The differences in energy use between identical houses have been used to illustrate the great variety in how houses figure as a nexus for daily practices (Gram-Hanssen, 2011). However, even though a house is recognised as an element of practice, it is not really conceptualised. More generally, understanding of the home and house in social scientific energy research has not been subject to detailed discussion until very recently (Ellsworth-Krebs et al., 2015). Whereas certain spaces, such as the kitchen, bathroom or space-extensions through retrofits have received attention, the broader understandings of house and home as an element of practice has been less touched upon. Recently, however, Ellsworth-Krebbs and colleagues (2015) pointed out that

pairing heating with the concept of the house turns the focus on the technical sphere of energy use, such as efficiency and regulation, whereas heating at *home* acknowledges greater complexity and stresses the *socio*-technical aspects of energy use. It follows that stressing the home instead of a house is a way to emphasise the social side of interventions instead of technical sides, allocating the users an active role of the dweller instead of a passive resident, and picturing occupant satisfaction as complex instead of definable (Ellsworth-Krebs et al., 2015). Even though these axes are simplifications and there are overlaps in the use of concepts, such a distinction gives a strong sense of the notions that have been understated in studies on domestic energy consumption.

3.2.3 Sensory, affective and bodily engagement with heat

A distinctive feature of these recent studies is the interest in the role of bodily and sensory engagement. Comfort is an affective complex of bodily sensibility (Bissell, 2007), and producing heat on a small scale often demands a great amount of bodily involvement. Despite the fact that feelings of cold and warmth are key drivers of economic activity, 'thermoception' – the sense by which an organism feels temperature – is a somewhat new concept (Vannini & Taggart, 2013). Vannini and Taggart (2013) argue that different thermoceptive sensations are a function of different ways of heating.

The variation of bodily involvement between different forms of energy can be described as 'hot' and 'cold' energies. Hot energy demands "greater intensities of participation in socio-technical and spatio-temporal processes than cool energies do because they are locally controlled by homeowners, rather than distally managed by utility providers" (Vannini & Taggart, 2014: 65). Autonomous off-grid dwellers understand thermal heat as attuned to the atmosphere of their homes by becoming more sensitive to the changing temperatures of their domestic surroundings, and by becoming more aware of the affordances of their technologies, of the local climate and resources, and of global environmental forces, and by becoming more sensitive towards their needs and preferences (Vannini & Taggart, 2013).

Heating and keeping warm are thus multisensory achievements and experiences. Wood heaters frequently listen to the frost and sounds of the fire, they feel the cold and warmth in their bodies, sense the wind and moisture, smell the fire and are surrounded by a multitude of visual things. These bodily and affective engagements enliven the understanding of the encounters with the more-than-human world, and broaden discussions on the relationships between technologies, bodies, culture and well-being. They further suggest more embodied ethnographic approaches to the experience of heat and practice of heating. From this view, involvement in heating is not an occupation but a connection, an emergent participatory openness to multiple goings-on.

3.3 Practices of wood heating

For practice theoretical studies, the detailed description of the practices that are subject to inquiry is the most focal task (Schatzki, 2002). However, as heating with wood is presented in the thesis papers, the following outline is not intended to be a thorough description of the practices of small-scale wood heating, but rather an introduction to the specific features in terms of practice theoretical thinking, and as pointed out by the previous literature. The picture given here is complemented in the thesis papers. More specifically, paper 1 discusses the different material engagements of wood heating, paper 2 the temporalities of wood heating, whereas papers 3 and 4 open up wood heating in respect to other practices and technologies.

3.3.1 Organisation of wood heating

The activities that contribute to wood heating are dispersed across time and space, and ordered by a range of temporalities from annual seasons to the daily rhythms of social life, as well as the temporalities of fuel and supply. While heating would 'ideally' allocate both warmth and work evenly across days, the work done for wood heating, and the indoor temperatures provided are not evenly distributed.

There is also great variety in wood heating. Unlike electricity, which is provided to the consumer through wires, heating with wood depicts different bodily and material routes. Distinctively, such heat provision is tangible for the user and allows itself to be managed, adjusted and moderated. Wood heating involves a wide range of actions across different spatial settings, and very different material elements and arrangements; it is both an on-going achievement, which orchestrates multiple more or less standardised practices, and an integrated practice involving procedures and specialised equipment, and it is recognisable, coordinated and regulated (cf. Warde, 2013). Is wood heating then too diverse and disparate to be seen as a practice?

Thinking through things, wood heating is made of a specific set of material elements: logs, tools and equipment for chopping and moving wood from the forest to the stove, wood-burning technologies such as stoves, fireplaces and central boilers, and assisting tools such as pokers. Operating many of these tools is included in time use, and there is a standardised and 'manualised' performance in accomplishing the tasks. Hence, in Warde's (2013) definition, using them forms recognisable integrated practices. However, this also shows a great variety in what goes under wood heating, as logging and managing fire are very distinct doings. Moreover, further materials, such as bodies, clothing, decorating, and heat deriving from other electricity appliances (cooking stove) also matter for the practice of keeping warm. Houses matter in terms of insulating surfaces, and climate and nature in terms of weather conditions such as temperatures, wind and humidity. Even though these are part of the accomplishment of keeping warm, using them do not figure directly in time use, and hence it makes sense to distinguish them from the practice of heating. This

makes clear the point that practices consist of distinctive material elements and broader material arrangements, as proposed in section 2.4. Thus, the practices of wood heating denote the multiple practices that go under the bundle of wood heating, and account for the broader material arrangements that contribute to the practice of keeping warm.

A further point to note is that wood heating is a combination of flexibilities and inflexibilities, and often part of a constellation of heating arrangements where the house relies on multiple sources of heat such as wood and electricity. On the one hand, small-scale wood heating denotes flexibility and autonomy, as it allows variation in indoor temperatures over time and space, liberates users from market expenses, and enables them to react to disruptions in the electricity supply. On the other hand, it also brings a bunch of inflexibilities: for instance, wood heating requires active attentiveness during cold spells, and it requires a certain level of skills and physical condition from the wood heater. Flexibility of systems of provision and layering of infrastructures and technologies provide new temporal reaches to consider in the dynamics of practice.

3.3.2 Meanings of wood heating

Wood heating is far from being meaning neutral – on the contrary it reproduces meanings ranging from cosiness to ideas on autonomy, nature-rooted living and locality, making it a mundane practice in which symbolic capital is invested (cf. Warde, 2015). Previous research has pointed to the various meanings attached to wood heating. For example, Hitchings and Day (2011) note that traditional connotations of the hearth include hospitality and bringing people together around the sources of heat. Hards (2013) interestingly points out that for modern dwellers, wood heating can also be seen as abnormal and attached to feelings of stigma and embarrassment. Inconvenience in general may be compensated by the importance of hearth-like focal points of heat, especially due to their sensory and affective facets (Devine-Wright et al., 2014). More generally, the routine property of wood heating yields benefits in the form of rhythmicity, familiarity and moments of being competent and satisfied (cf. Wilk, 2009).

Many of the concerns discussed in public documents and guides on wood heating revolve around the local emissions of burning wood, which are affected by the quality of the burned wood, and the burning process and burning techniques used. Indeed, wood is not a source of heat with low emissions, and high levels of local particle emissions, in particular, have raised concerns of wood burning as an unhealthy source of heat (Laumbach & Kipen, 2012). Especially in densely populated areas on cold winter days, the emissions levels may cause health problems. Whereas these air pollution problems are widely discussed in terms of health problems and physical factors, their social and cultural dimensions, reasonings and justifications are not frequently discussed (Cupples et al., 2007; Reeve et al., 2013). Hence, although many aspects of wood heating are tangible and controllable, it does not necessarily mean that environmental concerns are effectively integrated into the practice (Petersen, 2008). Yet, practice theory is involved in discussing the problems caused by

local emissions, for instance in management of peak demand to consider the need to use energy in sync with other people (Strengers, 2012).

3.3.3 Skills and convenience of wood heating

A further point to discuss is the skilful and convenient performance of wood heating. As a material characteristic, domestic systems for heating with solid wood imply large volumes of raw materials. Logs – pieces of wood – are chopped, dried, grafted, stored, and finally burnt in fireplaces of different scales and types. Wood heaters typically source the logs from their own forest, or buy them from a provider either as dried or wet, chopped or solid, piled or loose. Sourcing wood requires mastering logger skills, access to forest and the competent use of tools. When the logs need to be transported, road infrastructure and vehicles for transporting the wood are involved.

The popularity of wood heating interestingly speaks against the general appreciation of effectiveness, especially when considering the efforts required. Given the effort of cutting, chopping, drying and relocating logs, wood heating resembles what Vannini and Taggart (2013) describe as onerous consumption. For example, wood heaters report on home-based patterns of life that fit easily with the 'demands' of using solid wood as a heat source (Jalas & Rinkinen, 2013; Rinkinen & Jalas, *unpublished essay*). Such a social configuration makes wood-based heating reasonable, even if it is not convenient in the sense of increased flexibility.

Stove users frequently embrace other means and ends than effectiveness in domestic heating and comfort, and hence many advantages balance this inconvenience. In a study on Danish wood heaters, Petersen (2008) notes that wood burning was motivated by economic benefits, but they were coupled with other motivations such as a satisfactory indoor temperature, a sense of homeliness and sensuous enjoyment, and a broader understanding of the "stove as a token of the good home and life." Indeed, even if wood heating makes people wake up at night and causes alterations in a planned trip, at the same time it is a source of pleasure, as well as flexibility, security, empowerment and autonomy.

There are many further technical ways to achieve convenience in wood heating. Wood is seldom the only means of heating, but other solutions offer back-up systems and enable flexibility, and to achieve convenience in heating, many wood heaters rely on hybrid systems, where a backup and complementary heat supply is provided with, for example, electrical radiators. Often, however, fireplaces are only used to provide extra heat and comfort during cold spells or power cuts. Thus, backups offer convenience and flexibility. The active work required by these technologies and systems raises the questions of when, where and by whom the heating work is undertaken, as well as the effects involved in this bodily and aesthetic form of heat provision.

Moreover, the questions of autonomy and control appear to be particularly important. As Petersen (2008) notes, the acquisition and storing of wood constitute a visible and tangible activity, and particularly due to this visible supply chain, wood heating brings questions of power closer to the consumer (cf.

Fuchs et al., 2015). Wood heaters have not only strong responsibility but also strong agency and control when they heat their homes. On a broader level, as autonomy in household heating supply was found to be an underlying motive, it also refers more broadly to the importance of appropriating the inhabited space through active conversion and refurnishing (see Miller, 1998). Ultimately, performing wood heating denotes an active, embodied and skilled engagement with the space that goes beyond the notion of conversion.

3.4 Summary

The practice approach to the study of heating moves away from the unified understanding of heat as a demanded resource to its understanding as part of the practices in everyday life. A distinctive feature of the recent studies on domestic energy use and heating in particular is the interest in the role of bodily and sensory engagement with heat, and the active management of heat and service flows. However, heat may be something that is slippery and difficult to grasp: it comes out through technologies, through ideas of comfort and ease. For on-site heaters, wood heating is an orchestration of different tasks that are required to achieve the right level of heat. This brief and selective peek into recent studies on domestic heating also reveals that the home is a restless place: pressure points in space and time are always on the move, and consequently, the co-evolution of technologies, standards and social order appears as especially interesting.

A central claim of practice scholars is that standards should be assessed beyond the physical environment to include social dimensions and the standards of doing. However, whereas a lot of research has engaged in understanding the dynamics of comfort and convenience of social practices such as laundry and eating, and in explaining the escalating demand for air conditioning, the ways in which heating technologies are embedded in the daily routines have not been at the centre of research. It is increasingly understood that heating affects the costs and convenience of living, but taking a practice-theoretical approach to heating, urges to go further and ask how mundane practice of heating, with its different variations, stands out as a node in everyday life. This task may seem trivial considering the dominance of centralised 'non-coordinative' energy provision, and the relatively marginal role of wood heating. Yet, regarding the strong tradition of wood heating, and also in view of the recent change in the dynamics of energy systems towards decentralisation, this task can yield important insights, especially into the understanding of how everyday life consists of more or less coordinative practices, material arrangements and bundles of activities.

A number of important discussions, such as those around user innovations or community energy, have been left out of this brief review. Nevertheless, this overview helps us to position the more specific research questions for the papers, which are: 1) how the materiality and object relations of (wood) heating are integrated in everyday life; 2) how material arrangements of heating create temporal orders; 3) how disruptions prompt reflection on (small-scale wood heating) practices; and 4) how households adjust to and co-align with the

heating infrastructure of a new house at the moment of moving in. With these questions in mind – and the main research objectives on how the material-temporal dynamics of social practices are performed and accepted as convenient in wood heating, as well as how to theorise heating practices from the everyday accounts of practitioners – the following chapter discusses the methodological choices of this study.

4. Methodological choices

Following the theoretical discussions and review of the previous literature, this chapter serves as a space to introduce and discuss the methodological choices of the thesis. The notion of everyday life consists of emerging, sustaining and disappearing practices, and points towards an intensity of details and corresponding new methods to approach ordinariness. However, methodology and practice theory have somewhat of an intricate relationship, and the empirical work of carrying out everyday life studies and practice theory is not self-evident. This chapter shows that the traditions of everyday life studies and practice theories do not lead us to a specific set of methods, but rather encourage some methodological imagination, innovation and even unruliness. This chapter starts off with a reflection on everyday life as an object of study, which is followed by an outline of the research design.

4.1 Everyday life as an object of study

Intuitively, everyday life should be fairly easy to perceive, as it does not refer to the 'hard to grasp', out of the ordinary, the rare, and the exceptional phenomena of social life. Researchers themselves are practitioners in the everyday life, and hence are familiar with some of the practices they unravel in their empirical efforts. For example, it would be hard to deny that this study doesn't draw also on our own experiences of wood heating, dwelling in detached houses, moving homes and facing power cuts to complement the other methods of this study.

However, even though the object of study is the ongoing flow of events, everyday scholars tend to emphasise the struggles they are facing. There is even a certain sense of stigma attached to the study of the everyday, suggesting that everyday life is not worthy of study as it is too mundane, and too well known. Often, the sense of unease arises from the intimate nature of everyday life, as it is commonly seen as a private matter. Moreover, qualitative approaches in general may easily seem too 'small' in relation to the dominance of quantitative methods in contemporary sociology.

4.1.1 The challenge of situated language

In studies on everyday life, one of the focal methodological questions is whether to emphasise researcher-induced interpretations of human action or the

accounts of the situated members. How much voice can or should the research subject be allowed to have?

Symbolic interactionism and conversation analysis are premised on accounts of situated members and on meaningmaking in and through the interaction of humans, as they argue that everyday language and interaction is the premise of the social (Blumer, 1986). For example, the role of language, talk and communication in problem solving has become increasingly important for ethnomethodologists and particularly in symbolic interactionism (Emirbayer & Maynard, 2011). The crucial role of language in problem solving not only suggests that thinking and talking co-exist, but it is also an empirical claim about the nature of human talk. Suchman and colleagues (1999), when summarising the findings of workplace ethnography, go so far as to argue that in workplaces, talk primarily arises when there are problems and the collective resources for solving them. In a similar vein, Engeström and Blackler (2005) argue that organizations exist around objects of shared and recognised usefulness.

According to Schatzki (2002), sayings are a subset of doings: they are doings that say something. So defined, sayings need not involve language but yet the role of language is central in Schatzki's theorising. On this account, it is worth pointing out that even though Schatzki draws great inspiration from Wittgenstein, his interpretation of his work is not one that contributes to the 'linguistic turn'. As many point out, Wittgenstein has often been granted the honour of linguistic turn; however, his work does not actually privilege the linguistic, but rather it offers a way of integrating language with reality (Hekman, 2008).

However, materialistic stances of practice theories seem to downplay the role of situated language and talk as an ordering device. For example, for Shove, Pantzar and Watson, (2012) practices as entities are something that can be spoken about, but the practices and their situated linguistic performances are not at the centre of theorising. There are reasons for this. First, as practice theory decentralises the subject, it also calls for methods that decentralise the subject. The trajectories of practices reach beyond certain time and space, and grasping them requires a broader explanation than a situational one (Shove et al., 2012). This has also been noted in everyday life studies, as studying everyday life as the on-going unfolding of the ordinary rejects an individual-centred exposition, and rather produces accounts that matter collectively (see Sheringham, 2006; Crang, 2005). To accomplish the task of grasping practice dynamics, practice theoretical inquiries trace the practice as it occurs rather than produce additional talk and text. This is despite the capability of practitioners to talk about their practices (Hitchings, 2012). As a consequence, these accounts easily stigmatize situated accounts as individualistic. This is, however, not to say that practice theory is mute in terms of language, but nevertheless, accounting for everyday talk and text remains as a challenge for practice theorists.

The second reason for the downplay of language might be that the aim of practice theory is often to account for how environments and technologies

support and accommodate various practices, and describing this does not always come naturally for practitioners themselves (Thévenot, 2001). Considering this, interviews as a methodological choice may be considered as somewhat problematic, as they might disregard the material surroundings and the naturally occurring flow of everyday life. This is interesting, as it seems that the concern is that leaning on language would lead to accounts that do not grasp the element of materiality. This fear may lead to accounts where objects are followed, not human subjects, and where language is not central.

However, it can be asked whether privileging materiality also privileges the role of the researcher in making interpretations. Martens (2012) has noted that interviews yield more understanding on the organization of the practice (or practice-as-entity) than the activity dimension of practice (or practice-as-performance). This is partly because of the utilization of imprecise language in interviews, the inconsistency between talk and doings, and that the interview context encourages performance-related silences. When practice is verbalised, it starts to resemble an entity rather than doing, as Warde (2005) has also suggested in terms of guidebooks. Another notion by Martens (2012) is that the interaction between humans and materials is not prominently discussed in interview situations. Taken together, these notions suggest that to account for materiality in research is to induce talk about performances and doings (Schiølin, 2012). However, practice as entity may be more easily represented, unlike performance, which does not actualise and document in language as effortlessly (Shove et al., 2012).

It may be suitable that ethnography is frequently considered to be the proper way to account for everyday life as it accounts for both the environments and doings – but there is also a need to bring in the practitioners with their own encounters as opposed to the accounts of privileged researchers. It has been argued, for example, that the overwhelming emphasis on ethnography blocks the consideration of more subtle reflexivity (Markham & Couldry, 2007). Practice members' accounts of their everyday life, such as diaries, interestingly seem to fall in the middle ground of ethnography and participant-focused methods such as interviews.

4.1.2 Registering everyday practices

The ambiguous everyday might even seem evasive and unachievable by rationalist thought, but it should not be taken to suggest that it is unyielding to forms of representation. As already pointed out, sensitivity to everyday life has been increasingly tested and called for, especially in sociology and material culture studies, as well as in geography and anthropology. The spirit of critical thinkers such as Lefebvre is that everydayness needs to be appreciated in its own terms, and this calls for methods that match the sur- or ultrarealism claimed for in studies on everyday life (Highmore, 2002). Attempts to capture and register everyday life require that we find ways to take it as a fore-grounded voice instead of a background voice through methodological inventiveness:

> [...] the singularity, the here-and-now-ness of everyday life requires invention in a variety of ways... for making the everyday vivid, of rescuing it from an undifferentiating scrutiny. (Highmore, 2002: 171)

> [...] once it is understood how many entities there are in the world, of which we are able to name but a few, then capturing the traces of these entities, even for a brief moment, will clearly involve unconventional means, a kind of poetics of the release of energy that might be thought to resemble play. (Thrift, 2008: 12).

Both these quotes suggest that capturing the essence of everyday life should point towards an appreciative understanding and methods. If the repetitious, the boring and the mundane are facets of everyday aesthetics, there may also be brute and apt ways of describing it.

One recent development is the massive rise online data such as forums and blogs as sites filled with characteristics of everydayness. These are generally public documents filled with quotidian and mundane text, photos and videos – logs of everyday activity. Blogs are primarily sites for active relational online networking (Marres, 2009), but as they are structured around 'I' narratives, they can have an ethos of immediacy, similar to diary writing (Hookway, 2008). In addition, many posts are written around certain objects, and they are done to express opinions.

The analysis of such sites contributes to a new ethnomethodological approach to observation in which researchers seek to use the conventional notions of discourse and conversational analysis to "focus on ordinary, mundane, naturally occurring talk" (Mann & Stewart, 2000: 86). Beyond Reed's (2005) notion that a blog is a constitution of the self – 'my blog is me' – blogs can constitute more, such as the everyday environment. For example, climate forums as sites of discursive practice have been used to analyse the social construction of large phenomena such as climate change (Barr, 2011). Forums and blogs are thus largely welcomed as an extension of the research toolkit (Hookway, 2008).

Many methods indeed move towards such appreciativeness, and can also serve practice-theoretical thinking. For example, human geographers have shown interest in the diary method and its combination with photo-elicitation (Crang, 2005; Latham, 2003). It seems that photography as one of the media of surrealism has found its way into organizational aesthetics and also more broadly into studies on everyday life (Sheringham, 2006). However, methods of public ethnography, mass observation and blatant diaries of the ordinariness have not been exploited in a similar manner (Sheringham, 2006). The methodological approaches of the studies on the domestic domain have largely relied on qualitative interviews, surveys, case studies or a mixture of these (e.g. Gram-Hansen, 2011; Strengers & Maller, 2012; Martens, 2012). Emphasis on research-induced ethnographic interviews, and observations of daily life has (more or less deliberately) distanced accounts from the analysis of talk and text. Therefore, there is a call for texts that are representational and significant in organising and shaping everyday lives, which in one way or another capture the ever-changing present (Plummer, 1983; Elliott, 1997). However, the question is not only what kinds of texts are used (and produced), but also how these texts

are used and what kinds of position they are assigned with as enactments of social life (Halkier & Jensen, 2011).

4.2 Research design

4.2.1 Using diaries in the study of practices

Diaries in research

The variety of diaries used in research is broad, ranging from time-use diaries to personal autobiographical reflection. For example, time-use diaries are frequently used in studies on housework and social practices to demonstrate the differentiation of consumption patterns (e.g. Cheng et al., 2007). As Southerton (2006; see also Walker, 2014) notes, time-use diaries and some ethnographies grasp the duration, sequencing and to some extent synchronisation of activities but more subjective notions such as tempo are more difficult analyse.

Written diaries range from unstructured personal accounts to more organised texts produced in response to specific 'directives' such as mere recording of activities and observations. When used in research, diaries can be solicited, induced to meet a specific research objective around a specific period or event, or they can be initially written for personal reasons and collected afterwards for research purposes. There are established research traditions in which people are invited to keep diaries of travel, of weather or of health, and in which the resulting data are aggregated and analysed for different purposes (Alaszewski, 2006). Diaries also feature in studies of human geography (Meth, 2003; Morrison, 2012), and in feminist research as tools of self-reflection and empowerment (Stanley, 1995; Jokinen, 2004). However, as far as we are aware, free-form, 'open-call' diaries have not been used to study practices, not at least in the domain of heating practices or energy use more broadly.

Diary writing is a guided convention of representing everyday activities, but they do not provide authentic access to real life and are not free from systems and structures of representation (Latham, 2003). While a range of conventions, such as regularity, structure, privacy and emphasis on the familiar and the intimate, governs diary writing, the details that diarists provide are often inconsistent, patchy, partial and fragmented. In contrast to thorough ethnographic inquiries, for example, the accounts provided by the diarists lack a certain, more or less consistent, level of detail and comprehensiveness. The diarists vary in their ways of composing the diary account and in their decisions on what counts as a proper account of the ordinary day, and also stretching the conventions of journaling. This is not surprising; after all, their lay authors are not bound by scientific conventions, nor are they (usually) under any obligation to make reliable observations. Since diaries are necessarily singular accounts rooted in the conditions of their production, much is indeed lost when they are read and interpreted out of context (Meth, 2003).

Yet, free-form written diaries deliver intriguing subjective accounts of everyday life. It has been suggested that diaries are not merely illustrative but rather *constitutive* accounts as they can, for example, more than capture

emotion in process (Fineman, 1993; Sturdy, 2003). Diary texts are also taken to grasp embodied and emotional practices in the making and offer snapshots of particular social spaces (Morrison, 2012).

Moreover, diaries appear as a potential method across the literature on everyday life (Lefebvre, 1947; Crang, 2005). Henri Lefevbre (1947) noted early in his project on theorising everyday life that such methods help to bring out the mundane, repetitious and blatant nature of the day-to-day life, and repetitive diary keeping is seen as a central tool to approach the self. Sheringham (2006) even raises the diary as one key methodological outcome for the study of everyday life. The fact that diaries are frequently ambivalent or that they represent events and moments that fall outside dominant discourses and rationalities is something to be valued. In these respects, diaries are especially useful in revealing experiences that are always emerging and always uncertain (Sheringham, 2006). In addition, following Certeau (1984), various commentators argue that the purpose of enquiring into the realm of the everyday is not to preserve it, but rather to (re)invent it: diary writing is thus seen as a generative and productive endeavour in its own right.

It is clear that different methods have different characteristics, such as depth versus breath, singularity versus generalizability, site-based study versus drawing on a wider range of respondents, and so forth (see Lamont & Swidler, 2014). One of the benefits of diary writing is that it is rather easy to command and requires few particular skills, and it is then effective in terms of democratising authorship and favouring members' accounts. Furthermore, compared with continuous videography of, say, 24 hours, a diary account, even though not following strict guidelines, appears as a structured and well-known method.

At the archive – Conducting research with pre-collected diaries

Admittedly, we – my colleague Mikko Jalas and I – were largely unaware of the tradition of diary studies when we started working with our diary material. The diary collection explored was organised by the Finnish Literature Society in 1999 and 2009. The collection consists of one-day free-form diaries with no specific guidance on what or how to write – the call was merely entitled 'The day of the Finn'. The diaries document the course of two days, Tuesday 2 February 1999, which was a very cold winter day, and Tuesday 2 February 2009, which was a mild winter day in a record warm winter. The broad call in newspapers and other media was highly successful, especially in 1999: altogether, 23,500 diaries were archived in 1999 and 11,500 in 2009. Of these, respectively 19,000 and 7,900 diaries were written as a school assignment and are not included in our analysis. Despite this, however, more than 8000 diaries of adult Finns were available.

Convinced of the uniqueness and potential of the archive, our task started by going to the Folklore archive in 2010. With the help of the archive workers we received folder after folder of hand-written and typewritten pages of one-day diaries that the call had yielded. These diary pages appeared as hidden gems to be approached with an open mind.

The diaries range from half a page to 30 pages in length. We randomly read through 1000 diaries: 3100 pages from the 1999 collection and 4 archiving boxes from 2009. We extracted 350 excerpts that related to heating or indoor thermal comfort and a further 158 that related to wood-based heating systems. These excerpts varied in length from a few sentences to whole diaries. Following this process, the excerpts were re-read several times from different points of view: the main focus was on the temporal structuring of wood-based heating and the position of object relations in the practice of keeping warm. No quantification of the number of papers engaging in a particular theme was undertaken, but rather our analysis summarised the ways that respondents operated heating systems, coped with the related demands and achieved comfort during cold winter days. In reporting our findings, we have respected the anonymity of the diarists and changed the names of people and places.

Analysing the diaries

As outlined above, there is a difference between using extant diaries as compared to the use of researcher-elicited diaries. The data that we worked with was a mixture of these both. On the one hand, this data set was research elicited – it was an intentional call to compile an archive of the everyday in the lives of Finns. Some of the diarists were experienced diary writers, commenting on how this is what they do everyday, but for many it was a task they just completed on that particular day. The intention to write for a purpose was easy to sense. On the other hand, these were also extant diaries, as we as researchers did not take part in designing the call. Thus, we had to play with the pages that were given to us. For example, no demographic data were collected from the respondents except for their age and place of residence, and there was no access to personal trajectories, or the possibility to conduct follow-up questions. However, as Latham (2003) points out, and central to our study, in order to register the solidity and enduring nature of everyday life we needed preserve a sense of openness, partialness, momentness and possibility within our accounts of the world, something that flees categorisation.

Accordingly, this diary data set served at least four different roles in our analysis. First, we used the data to extract details of the organization of heating work beyond what is available through the technical description of heating systems and firewood logistics. These details include the question of when, by whom and in conjunction with what other activities heating work is performed. As such, the diary data enabled us to form a more detailed view on the meshing of activities than provided by interviews.

Secondly, as one of the effects of the deeply ingrained practice of solid wood-based heating is that it is hard to assess in terms of convenience, we aimed to account for the way in which rather demanding and non-convenient practices are and have been fitted together with other aspects of everyday life. This concerns, for example, (the assessment of) the convenience of arrangements. Diary data expose interesting (if troubling) moments in which rationalities are absent or only emerging: diaries stress the legitimacy of the ordinary and mundane, and provide an analytical lens that avoids the collapse of the category

of elementary observations with those of working and evaluating, as we discuss in depth in one the papers (Rinkinen et al., 2015).

Thirdly, diaries offer different layers for interpretation. For example, diaries offer a layer of interpretation in which respondents encounter and begin to make sense of their environments. While this can also be achieved with other methods such as photography-interview combinations, it is yet more interesting that such sense-making is an inherent part of diary writing. In many respects, the practice of writing a diary and using it as a possibility to study practices comes close to the idea of auto-ethnography, or perhaps even more aptly what Islam (2015) calls as 'para-ethnography', which involves collaboration with practitioners who are themselves producers of cultural analysis rather than sources of raw data. If we see practices as realised in and through embodied performance, then auto- or para-ethnographical inquiries provide a clue into thinking about how a personal embodied experience may inform understanding of the social (Valtonen, 2013; Larsen, 2014).

Finally, the data can and have been used to inform researcher-induced categories such as 'experience of time', about which the diarists themselves seldom write directly. For example, the experiences of time were analysed by considering the unexpected conditions and failure in coordination (see also Southerton, 2006), descriptions of idleness, and the flow of effectively coordinated activities across time and place. This also confirms that the interpretations of the diarists are enmeshed with those of the researcher when conducting analysis based on the diaries. This is explicated in more detail in the following.

4.2.2 Diarists as 'everyday theorists'

With the help of this diary archive, an open-ended approach towards everyday life can be envisioned. Such an approach abstains from studying domestic energy consumption as a pre-given category and rather, it studies the practice entities that fluctuate around, for example, the needs for and means of house heating and staying warm. The diaries are not treated as traditional biographical data, the theory–practice relationship is called into question. As Islam (2015: 18) proposes, rather than argue whether theory 'matters' for practice, theory itself can be viewed as a kind of practice (albeit a very specific, nondirect form). In a similar vein, practice can be viewed as what theory becomes when filtered through diverse lenses of interests, interpretations, and material constraints.

These notions of theory–practice relations have consequences for both the positioning of the researcher and the informant. Ethnographic authority does not have to only be centred in the researcher, but rather authority is distributed in diverse ways between the researcher and informants (Islam, 2015: 6). Our role here was to give articulation and conceptual structure to the partially formed theoretical insights of diarists.

To some extent, this reconsideration of the researcher and informant roles is an attempt to encourage increasingly reflexive practitioners and play the game for their benefit to yield both appreciative and empowering accounts of everyday life. Thus, there is the potential to cultivate discussions that can expose routines

to reflexive thinking, despite the claim that practices precede individual action and indeed condition it (Bourdieu, 1990; Wilk, 2009). Diary writing as such is an act of reflexivity, and displays peoples' adaptations to new situations and coping with ongoing existential challenges (Gardiner, 2000). Also, the unstructured nature of the diary writing process proved crucial in developing an everyday approach to heating. If the diarists had been given more direction, and if the Finnish Literature Society had sought to make the diary process 'useful' for research, it would have been difficult and perhaps impossible to map genres and styles of representing object relations or to 'see' the various modes of engagement to which these styles relate – and on which much of the theoretical insights of this thesis depends. The openness of the description also owes to the design of the diary call, which did not pay attention to heating, but heating only emerged through its linkages to other doings and entities.

In conclusion, the role of diarists is to make choices in registering the everyday. Having said this, diaries could be considered as snapshots of reality that might often be overwhelming with ambiguous detail and, even purposefully, fail to narrate, and make sense of reality.

4.2.3 Interviews on the pressure points of everyday life

While the diary archive gives a certain understanding of the course of two winter days, interviews provide more detail about the material and temporal dynamics of heating practices around distinctive events. From a practice theoretical point of view, the interview itself can be taken as a practice, and can and should be reflected in relation to the practice of primary interest. It is then important to consider how interviewing and speaking (as a practice) reveals and hides certain aspects of practice (Moisander et al., 2009). Interviews can also turn the empirical work into an intense act of sharing and developing understanding, as they evolve into more two-way communicative relationships.

Selection of the events

Besides the diary archive, another data set that we draw from consists of interviews around two mundane but still special occasions: power cuts and moving home. These events happen only occasionally, but they might have a significant effect on how everyday life is carried out, and how adaptation to the novel and exceptional events happens. Power cuts are clearly disruptive events, making the running of normal, electricity-dependent activities difficult, or even impossible. Moving home, on the other hand, is a life event that can have many reasons behind it, but it is usually anticipated, planned and even waited for. Yet, it may have a disruptive side to it, as the new living environment needs to be familiarised with, and dwelling in the new house needs to be learned.

As such, these events could serve as research topics in themselves, and many studies on them have indeed been conducted. The approach of this study, however, is selective, as the focus is on how the user-technology interface was remade or built as a consequence of these disruptions, and not, for instance, on the broader system-level or political dimensions of power cuts, or the relation between the housing market and the energy performance of housing.

Conducting interviews on power cuts and methods of analysis

Interviews were conducted with rural households and governmental and business actors who had faced wintertime electricity blackouts in January 2011, followed by power cuts in the summer of 2011 and at the start of 2012. Altogether, 14 interviews were conducted in Autumn 2011 and 2012: six in-depth interviews with households living in detached houses and eight thematic interviews with local business and governmental actors. The interviewed households were dwellers in a rural Finnish municipality in the province of Eastern Finland. This particular municipality was chosen because it was one of the areas where the power cut in January 2011 lasted longest, for up to 7 days. This power cut was also reported as somewhat historical because of its extent, duration and the unusual weather conditions, with temperatures down to −25 °C.

The six interviewed households were chosen through word of mouth. Initially, a local fire manager was contacted, and he was helpful in suggesting and organising potential interviewees. Our interviewees were also asked to suggest potential interviewees. All the interviewed households were users of centralised electricity production, but had hybrid heating solutions based on electricity and different kinds of wood-fuelled stoves. In addition to households, a local home service worker, a representative of the congregation, a maintenance firm worker, a local retailer, the chairwoman of the local council and two representatives of the utility service company active in the area were interviewed. These were contacted directly. These interviews were both face-to-face (in nine cases) and phone (in 5 cases) interviews, semi-structured, and lasted up to 1.5 h. The emphasis of the analysis was on the interviews with households, while the other interviews were used to reflect upon the broader perception of practice.

The interviewed households were asked to provide a detailed description of their heating practices concerning both the 'normal' situation and the disrupted situation. In carrying out the interviews, careful attention was paid to what kinds of understandings, meanings, materials and competences were attached to power cuts, how these were reflected in the normal state of the practice and how its elements and dynamics were associated. The interviews were transcribed and thematically coded using Atlas.ti, focusing on the circulation of practice elements in the normal situation and during disruption.

Conducting interviews with house movers and methods of analysis

In the second stream of inquiry, ten interviews with new homeowners were carried out in order to understand how they build idiosyncratic heating arrangements and develop practices based on their own premises in a dynamic, mutually aligning performance with the socio-material entity. The study started off with the idea that the ways users learn to use the house and how adaptive their practices are in relation to the material arrangements informs us about how users evaluate the house.

The empirical material consists of in-depth interviews and house tours with residents who had lived for at least one heating period in a detached house outside the area of district heating. The interviewees were families living in the southern parts of Finland and they were recruited by word of mouth. In selecting

the interviewees, the following selection criteria was set: families living in detached or semi-detached houses, excluding recreational residences; both old and newly built houses, but rejecting the ones built by the occupants; and houses from low value to an average price, excluding high-end houses due to the relative indifference of the owners towards heating costs. We also tried to catch the interviewees in different stages of the appropriation process (cf. Ilmonen, 2004).

The interviewed households were selected to include a variety of heating technologies ranging from wood heating to central, electric and district heating, and a variety of heat pumps. Five of the cases were households that had renovated the heating system since the purchase or were in the process of doing so, and four of them had carried out no renovations. Interviews with residents, for example, in a passive house with high electricity consumption, and in houses with a laborious pellet system, and ground source heating installed by the seller were carried out in Finland during autumn 2013.

The interviews were complemented by house tours and at-hand documents on energy use (the energy certificate of the house, energy use data). House tours – even though recognised as a method for improving the understanding of occupant-house dynamics (e.g. Pink, 2006) – have not been fully reflected on in energy research (Ellsworth-Krebs, 2015). For house tours, we asked the interviewees to walk us around the house and explain different aspects of heating. These tours were photographed and transcribed and they were helpful in giving us a more holistic understanding of the physical setting of heating and its embeddedness in relation to other parts of the social space. For example, questions of access, usability, aesthetic evaluations, and examples of hit-and-miss types of learning figured in these tours. In the analysis phase, specific attention was focused on the entwinement between competence, materials and meanings in the emergence and reproduction of the heating practice.

4.3 Summary of data and methods

The research objectives set in this thesis problematize the material and temporal dynamics of heating practices, as well as the theorisation of heating practices from the everyday accounts of practitioners. In order to meet these aims, an appreciation of details of the organization of heating work beyond the technical description of heating systems was emphasised. Whereas diaries reveal the complexity of how ordinary doings are performed, interviews allow us to focus more deeply on a discrete event. Table 2 summarises the data and their position in the four thesis papers; it also clarifies how the data were used for the understanding of practice, and which aspects of practice were emphasised.

The following chapter summarises the insights of these empirical studies into the understanding of practice and the role of materiality within. 'Insight' refers to the capacity to gain accurate and deep understanding of something, and considering the methodological approach of this thesis to treat practitioners as everyday theorists, it aptly emphasises that these findings are deeply rooted in the everyday understandings of the practitioners.

Table 2. Description of the data.

Paper	Data	The use and position of the data	Understanding of 'practice'
Object relations in accounts of everyday life	SKS Diary collection 'The ordinary day of the Finn' (1999 and 2009)	Discerning the multiple, dynamic and co-existing roles of things within and beyond matters of practicality and use	Sayings and doings that relate to staying warm stand out as a broad category not only of practical activity, but also of encountering, description, and evaluation
Stacking wood and staying warm: Time, temporality and housework around domestic heating systems	1) SKS Diary collection 'The ordinary day of the Finn' (1999 and 2009) 2) Preliminary understanding of wood heating	Extracting details of when, by whom and in conjunction with what other activities heating work is performed. The data also provide views on the experience of time	Not studying heating as a pre-given practical category but something emerging from the data. A detailed, yet incomplete view on the meshing of activities. Serves as a proxy for participant observation
Electricity blackouts and hybrid systems of provision: users and the 'reflective practice'	(1) Six in-depth interviews in a Finnish municipality with residents living in detached houses and who had recently faced a power cut (2) Eight thematic interviews with local business and governmental actors	Analysing the understandings, meanings, materials and competences attached to power cuts by households	Understanding of how elements of practice circulate, de-link and become dormant in a disruptive situation and how this can be understood through and as a 'reflective space'.
Dynamics of heat: Houses, new dwellers and the formation of heating practices	Ten interviews and house tours with households who have recently moved houses, complementary documents on energy use	Analysing the dynamics of co-alignment between practitioners and the material arrangements of heating	An emerging and resilient gathering of humans, materials, skills, and teleo-affective structures

5. Logs, hearth and home: Insights of the papers

This chapter summarises the insights of the four thesis papers. All of the papers foreground the dynamic aspects involved in heating by drawing attention to issues of flexibility and inflexibility, new, active and dormant, and emergent and disappearing engagements within and between practices. Recognizing different material and temporal engagements in practice extends questions of practicality and 'doability' to include evaluative, a-teleological, and aesthetic engagements, and is helpful in distinguishing the multiple roles materiality plays in practice.

5.1 Paper 1: Object relations in accounts of everyday life

In the article *Object relations in accounts of everyday life*, published in *Sociology*'s special issue on Sociologies of everyday life in 2015, and co-authored with Mikko Jalas and Elizabeth Shove, diarists are treated as theorists of the everyday to expose narratives that reveal the roles things play in the reproduction, the experience and the reporting of the everyday. With the help of the diarists, ideas derived from the sociology of everyday life (Certeau, 1984; Thévenot, 2001; Highmore, 2002; Lefebrve, 2004; Sheringham, 2006) and anthropological studies on materiality (Ingold, 2008, 2012), the article highlights that materiality and object relations are integrated into accounts of everyday life in different ways in relation to their practical form, and argues for a more complex understanding of objects and object relations in theories of social practice, and in studies on everyday life.

The article focuses on things in use by exploring how relations with objects enact and reproduce everyday life in practices of keeping warm. Our reading of the diary entries on the topic of heating and keeping warm led us to identify descriptions in which diarists 1) encounter the object world, 2) act in a materially constituted world (carrying out practices) and 3) evaluate the object world and practices. All three modes reveal how materials figure around the practice of heating. Aside from the use of materials as part of practical action, materialities are used for and prompt moral evaluations and aesthetics appraisals. The modes are widespread, not unique to one diarist or another, and they often co-exist within diary entries, and even within the same vignette. These modes of engagements show that objects are far from being static

artefacts, but rather animators of the 'doing' of everyday life and generative of emotion and engagement.

In the first mode of object relations, the temporal frame of handling and active doing with materials is constricted, without prefiguring or causal relations. As such it is perhaps best understood not as a representation of personal mental processes, but as a particular open position for the state-of-the-world, and as an essentially aesthetic form of expression. In the second mode, materials consequently figure as tools required for the performance of specific practices, and as instruments that can be handled in variously effective ways: material surroundings are noted, and noteworthy because they are actionable. Diarists mobilise understandings of competent action within pre-existing material and social conditions, and agency, materiality and shared conventions mesh (Thévenot, 2001). In the third mode, accounts are infused with normative evaluation, affirming or challenging the worth of specific practical-material arrangements or of entire ways of living. Judgements of good and bad do not relate to private matters of convenience, ease or joy, but instead refer to the wider conditions and consequences of the action. In short, this mode introduces the public eye of a 'generalised other' (Thévenot, 2001).

In selecting events, observations and ideas that are worth reporting, the diarists are actively engaged in positioning practices and their elements in some temporal and spatial frame. Hence, the article makes some specific notes concerning temporality: first, material engagements in practice hold different temporalities in tension, and, second, the temporal 'frames' of material engagements can be more or less constricted, suggesting that materials can be prefiguring practices in a varying strength (cf. Schatzki, 2002). To specify, when diarists report on their encounters with the material world they report on a world in which objects appear to be stable – they are present-at-hand – suggesting a form of a-temporality. In such accounts, objects appear frozen in time and space, as if caught in a photographic snap-shot. Sometimes, there are hints that objects have an active life, but for the most part, diarists writing in this mode rarely refer to either the past or the future (Beyes & Steyaert, 2011). By contrast, accounts of things in action emphasise both the flow of events and the need for sequencing, synchronisation and temporal coordination. When describing causes and consequences, diarists move back and forth in time, extending the temporal scope of their account well beyond the moment of doing. Practice-theoretical studies do the same: analysing the lives of practices as they unfold over time, and describing the responses and actions of practitioners (those who do) within the on-going flow of daily life.

The findings of this study point to the understanding of materiality as weaving into the everyday through different domains, and contribute to the demand for taking materialities and interdependencies seriously in everyday life studies (Neal & Murji, 2015). For sociologists of the everyday, this exercise underlines the centrality of object relations and of their temporal reach: in this it shows that the realm of the everyday is not simply a realm of immediate experience. For theorists of social practice, the study provides a subtler and a more complex account of how material arrangements play out in practice. It does so by

recognising forms of material engagement which are evidently not related to the ongoing enactment of specific practices and which resist and are opposed to coherent or rational narrative ordering, but which nonetheless constitute crucial aspects of everyday experience. In addition, the study provides an account of how object relations evolve and of how things simultaneously exist as elements in a flat 'background', as dynamic components of ongoing action, and as sites and vectors of judgement and evaluation. This helps fill out an otherwise overly 'functional' view of things which concentrates on moments of use and utility, underplaying their uncertain, ambivalent and contested role in the conduct of daily life, and underestimating the overlapping and multiple temporal registers through which object relations are defined. On all fronts, the diarists encourage us not to settle on static schemes and categories, but to focus on the multiplicity of co-existing object relations and to think about how temporal frames swing into and out of view.

5.2 Paper 2. Time and temporality around domestic heating systems

The first thesis article called for a complex understanding of material dynamics that go beyond pragmatic concerns, and pointed towards temporal multiplicity in object relations. Against this, the second thesis article turns attention to the temporal dynamics of the practices of wood heating and the achievement of keeping warm.

The article *Stacking wood and staying warm: Time, temporality and housework around domestic heating systems*, published in *Journal of Consumer Culture* in 2013 and co-authored with Mikko Jalas, discusses how technical systems order everyday life and create organized temporal patterns of activity. Based on our reading of the diary data set provided by the Finnish Literature Society, we examine the aspects of time and temporality around the use of firewood in domestic heating.

The study shows how tasks of wood burning have different temporalities, and recognises five distinctive but overlapping temporal categories: synchronization, sequences, periodicity, rhythms and tempo. These categories were informed by previous sociological studies on the temporal organization of human activities (Fine, 1990; Lauer, 1981; Southerton, 2006; Zerubavel, 1985).

Wood heating practices may have a fixed position in the everyday, but this position depends strongly on other home-based social activities and climate and weather conditions. Our findings support Walker's (2014) notion that households have their own 'energy rhythms' in respect to the heating arrangements, the achievement of sufficient thermal comfort, and other social patterns. Managing these rhythmic profiles means managing the rhythmic patterning of the practices out of which energy demand is produced (Walker, 2014). What connects the rhythms of some practices is the synchronisation of activities and practices, which our study notes as crucial in performing wood heating. The findings also indicate that wood heating is not only a temporally fixed practice following social activities and weather conditions but it also a

'time filler'. Within a bundle of practices, there is hence greater variation of temporal patterns than what Southerton (2006) suggests. More generally, it is difficult to fit wood heating in the generic narratives of harriedness, where consumption, family and work pressures lead to 'squeezing' of other practices (Southerton, 2003).

The analysis on the temporalities of wood heating effectively contributes to the recent discussions that link energy and temporalities (Strengers, 2013; Walker, 2014; see also Spurling, 2015) by highlighting the material dimension of the temporality of practice. Our study suggests that the material configurations of practice not only affect the temporality of the everyday but the relationship is two-way: the temporal demands of everyday life affect how different materialities or systems of provision are enacted in social practices. More specifically, the findings of the paper underline that materiality and temporality are not separable but entwined in a continuum of action. The bearing of materiality on human activity and social life lies not just in the constitutive and causal relations that hold between individual actors and particular objects, but also in how material entities are connected with temporally and spatially extended manifolds of organized human actions. Everyday life is thus responsive to multiple co-existing temporalities (Shove et al., 2009), and as we suggest in the first thesis paper, material engagements indicate different temporalities (Rinkinen et al., 2015). Especially when considering the ways in which materialities enter, settle and leave the domestic sphere, understanding these temporal dynamics becomes relevant.

Practice theorists note that technologies differ in their time demands, as well as their ability to 'make time' (Shove et al., 2009). Notions such as slow technology and time-demanding technology open this up, but further temporal dimensions such as sequences, synchronization and rhythmicity also reveal the temporal demands of technology, which is not grasped in the continuum of time demands. Hence, the case of wood heating confirms the notion that the success (or failure) of new technology such as smart grids depends on their capacity to 'fit' into existing practice constellations (see e.g. Bulkeley et al., 2014), but it highlights that such alignment happens in all the temporal dimensions (synchronization, sequences, periodicity, rhythms and tempo). This gives a broader understanding of how temporal elements of practice are linked together through material arrangements, and how materiality forms dependencies for doings. This additionally reveals how practices set temporal boundaries for life.

The temporalities of domestic heating also offer insights on the intersections between energy use, material arrangements, and natural and social rhythms. While this is only briefly touched upon in the article, it helps to think about the entwinement of materiality and temporality. Indeed, the article shows that temporality offers a route to introduce processes of nature to the understandings of domestic energy use, not as exterior processes but as something ingrained in the practice. Nocturnal rhythms, seasonality and processes of decay can be seen as 'beyond human' process, which are settled in with layers of complementing, conflicting and coinciding rhythms. Power (2009: 1031) has argued that in contrast to the temporal demands of domestic technologies, work schedules and

social relations, nature's times represent a much more elusive, dynamic and situated set of times, rhythms and temporalities. However, the case of wood heating shows that the reasoning can be the other way around: nature time is universal, whereas socio-technical time is more situated. Nature's times produce a domestic timespace that frequently and readily exceeds the influence of human homemakers. Hence, rhythms of the seasons pave ways for a special orientation towards being in a world that is difficult to reach in a hectic urban life (Rantala & Valtonen, 2014). Finally, wood heating follows the cyclical rhythms of nature and as such we could say it is inconvenient, or even irrational. However, following Lefebrve's logic, by acting on nature's times, wood heating avoids the conflict that the linear rhythms of rationalised modernisation face with nature (see Highmore, 2004). However, as a practitioner heating with wood, one obviously has to deal with and find a balance with other 'linear' rhythms of the modern world.

As a drawback, this paper focuses merely on the 'actionable' mode of material engagements. Regardless of its contributions, what this paper fails to address is the notions derived from the previously summarised paper on object relations. For a broader understanding of temporality, understanding of the temporalities in and around the multiplicity of object relations is needed. However, our approach can be taken as a contribution to discussion on the role of 'non-human' objects and processes within practices, and how the temporalities of social practices are enmeshed within the technological order.

5.3 Paper 3. Electricity blackouts and hybrid systems of provision

The previous papers discuss the different temporalities of material engagement, as well as the temporalities of the practices of heating. The following two papers study disruptive events to further explore the dynamics of active and dormant, and novel and 'old' materiality within and between practices. From a practice theoretical perspective, disruptions – temporary breakdowns in the flow of events – are important in understanding the norms, practices and technologies that construct the socially accepted definition of normality (Shove, 2003; Warde, 2005; Trenttman, 2009). It has been argued that when some form of significant breakdown is encountered, practice is seen as something that is separate and discrete: people and tools are singled out from their relation with the whole and thus there is an epistemological change from object-object relation to the subject-object relation (Sandberg & Tsoukas, 2011).

Against this, the third paper, *Electricity blackouts and hybrid systems of provision: users and the 'reflective practice',* published in *Energy, Sustainability and Society* in 2013, presents a qualitative study of domestic space heating practices and their interruption due to a power cut. The paper asks how households living in detached houses with hybrid systems of heat provision are affected when they are faced with extensive power cuts of up to 5 days, and hence lack the normal provision of electricity. Specifically, the paper examines the impact of infrastructure disruptions in the daily performance of social

practices by exploring continuities and ruptures in heating practices during multiple-day power outages.

Previous literature on socio-technical dynamics has acknowledged that different disruptions in routines open up the possibility of political debates on the processes of service provision, and how they potentially re-structure the relationship between the provider and consumer (Southerton et al., 2004; Van Vliet et al., 2005; Spaargaren & Mol, 2006). However, from a practice-theoretical view, disruptions are not needed for change to begin or take place, but rather every activity is a potential change (Schatzki, 2010a). It has been argued that beyond the idea that the sudden absence of infrastructural flow creates visibility (Graham & Thrift, 2007), disruptions have broader consequences for approaching everyday life as a more open terrain (Trentmann, 2009). Thus, many studies focusing on disruptions confirm that disruptions are not a requisite for change, but rather an integrated part of performing practices (Chappells et al., 2011; Trenttman, 2009; Marsden & Docherty, 2013; Maller & Strengers, 2014). Similarly, there seems to be a consensus that the motors of change should be sought beyond reflective practitioners. However, this does not mean that disruptions are not relevant for a practice theoretical study.

The findings of this study contribute to the understanding on disruptions by showing that disruptions both withdraw material elements of practice, and also simultaneously resurrect dormant elements of practice. In the literature, it has been pointed out that experiences and memories can lie dormant and can resurface in times of disruption, bringing an opportunity to resurrect past skills in carrying out practices and, for example handling energy (Maller & Strengers, 2014). Hence, aside from their practical use, material things can also lie dormant without practical use and temporal ordering. The case of using wood heating as a backup for disruptions also shows that technologies and material arrangements can carry other elements such as meanings and competencies over time. Hence, wood heating, even though it had lost its place in the form of life, can still have a 'resonance' (Thrift, 2008: 8), but also beyond the role as a reminder. A recent example of this comes from Greece, where the economic crisis has had an impact on energy practices, and changed them in an unexpected manner. According to Knight (2014), wood heating was last popular in Greece during the 1960s and 1970s, but the country has now witnessed a return en-masse to wood-burning open fires and partly used as symbols of the economic crises and part of the coping strategies in the face of austerity.

In conclusion, the findings of this study urge us to think of disruptions in practice as temporal events. Disruptions reveal the rhythms that the infrastructure enables and supports. Large-scale infrastructures generate provision that is 'flat' and that does not require rhythmic or patterned action: their constant, fluent service provision has no other impact but an enabling and allowing one. Only when such provision becomes disrupted, it is visible and has a rhythmic temporal order. Disruption is a sort of change in how the elements of practice are linked or how they become broken, but this change is not a permanent one. Hence, the dormant elements of practice can be seen as a specific material-temporal dimension of practices. The paper shows that

moments of disruption can resurrect material things and technologies from dormancy, and thus reveal another layer of temporality and materiality – another layer of doings. This allows us the discussion on 'reflective' practices, not practitioners, as a potential source of change. Disruptions such as power cuts contribute to the evolution of practice over time.

5.4 Paper 4. Dynamics of heat: Houses, new dwellers and the formation of heating practices

The paper *Dynamics of heat: Houses, new dwellers and the formation heating practices*, co-authored with Mikko Jalas, focuses on the formation of heating practices when moving houses. Drawing on an interview study on recent homeowners, the paper discusses how, at the moment of moving in, the fitting and linking of materials, meanings and competence happens in different phases of formation. The paper further opens out the ways in which practices are negotiated, adapted and adjusted in alignment with the material interface to reproduce the convenient practice of heating.

The paper elevates one object as the locus of interest – house – to analyse the alignment dynamics between practitioners and material elements of practice. The house is chosen as the object of study because of its central role as the material interface for a diverse set of practices (Shove, 2003; Shove et al., 2009; Miller, 2001), including heating. While houses are a central figure in social practices, conceptualising them within the practice theoretical toolkit is a challenge. For example, houses are supposed to exhibit openness for different practices within, and thus be adaptable to new technology, ideas, personal tastes and changes in the other practices of everyday life, and yet they have strong momentum in themselves.

The findings of the study suggest houses stand out as an interesting nexus for practices, and the related technical arrangements, infrastructure, policy and practitioners, as they mediate both standardisation and localisation, and transformation and rooting of social practices. While the standardization of houses has occurred through design and policy regulations, houses remain a result of local production activities. Each house has its own particularities. Relatedly, their long life span typically means that they need to be open to refurbishment and upgrading. Houses thus 'house' various technical systems and social norms of proper living. As a result, houses end up having layers of various technologies and local installations that bear witness to user preferences and local conditions to a far wider extent than most other products.

Beyond thinking about the role of houses, the study prompts other insights on the intersection between materiality in the formation of practices, and in particular the role practitioner in this mesh. It seems that the role of the human body is to form complexes with physical spaces, as material settings are internal to our social being, not external (Schatzki, 2002). Indeed, human bodies are 'designed' into the heating arrangements as users and as a recipient of service. Also, the bodilyness of the skills corresponds to the materiality of the spaces. Hence, in order to account for the formation practices, the study points to the

sensitivity to and respect for material processes and characteristics in and outside our practices.

The findings move us towards a conceptualisation of a house as a material arrangement that in a constant process becoming. The temporality and spatiality of integration reveals and justifies that beyond the notion of more or less closed scripts, scripts are also relational and dynamic. The processes of occupying the house can follow either the prior scripts of the house or allow agency for new agents in differing levels. All these notions suggest that it may be feasible to see the moment of when practice elements are merged more broadly as on ongoing process of alignment in making. The study further highlights that even though everyday life gathers the repetitive, mundane flow of daily activities, it also acts as a space for practices to emerge, disappear and to be reproduced and for multiple temporal and material order-makings to happen.

Finally, on the face of these two events – power cuts and moving homes – change can be conceptualised very differently. Power cuts represent very rapid, disruptive and interim change in the normal conduct of heating. As disruptive events, moving homes are very different to that of power cuts. In power cuts, there is a sudden absence of infrastructural provision. In the practice theoretical view, the explanation for such an absence does not come from external factors, but it is taken as an integrated part of performing practice (e.g. Chappells et al., 2011). When moving homes, the process of alignment and change can be very rapid for the practitioners (changing from one heating system to another), but it can also be more gradual (learning takes place over time). Moving homes is often a well-planned and anticipated decision and an event where movers have a great deal of agency.

5.5 Summary of the insights

I have now laid out a number of insights that emphasise the co-existing forms of practice-object relations as well as co-existing temporalities. Paper 1 asked how the materiality of keeping warm is enacted in the accounts of everyday life. The key theoretical concern of the paper was the material figuring in and around practices of keeping warm. In the paper, diarists were treated as 'everyday theorists' to see how object relations are represented through descriptive, practical and evaluative modes of material engagement. In conclusion, a broader understanding of practice dynamics beyond pragmatic concerns was proposed. In paper 2, the key question was the temporal order-making of heating practices. Theoretically, the paper presents a discussion on the relationship between temporality and material arrangements. The study discusses the synchronisation, sequence, rhythms, tempo and coordination of heating, and argues that materiality and temporality are entwined in a continuum. The findings of the paper contribute to the understanding of the different temporalities of systems of provision. Paper 3 taps into the role of wood heating during infrastructure failures. The theoretical motivation of the paper was to explore the disruption dynamics of practices. The study shows that dormant elements of past practices (materiality, competence, and meanings) can be

brought back into the integrated performance of practices to enable that maintenance of the normal. The findings of the study suggest that 'dormancy' can be treated as a material-temporal dimension of practice, and have implications not only for understanding of the flexibility and change dynamics of practices, but also for the stickiness of 'normal' practice. Finally, paper 4 asks how dwellers align with the material arrangements of heating in accomplishing the practice of heating. The theoretical focus is on the alignment dynamics between practitioners and material dynamics of practice. The findings of the paper contribute to the literature of practice theory by accounting for houses as an element of practice, and by outlining materiality as a process of becoming.

Taken together, these insights help us to consider that materiality plays a role in how elastic everyday life is, but also how its possibilities open up for practitioners: materiality can be viewed as an instrument of coordination. The work of Ingold (2011) has helped us to understand the ecology of materials as processes of *becoming* rather than being (see also Miller, 1998) that may be seen as an outcome of an open way of being-in-the-world.

6. Conclusions

This thesis is an explorative study on wood heating practices drawing from a diary archive and interviews with a focus on the normal flow of everyday life and its pressure points. The study delves into the world of wood heating with two objectives: first, to understand the material and temporal dynamics of heating practices in the dynamics of energy demand, and second, to theorise practices from the everyday accounts of practitioners.

This thesis contributes to the understanding of energy-intensive social practices on the following four counts. First, this thesis contributes to the understanding of materiality and temporality in theorising social practices. Each of the papers point to different temporal and material dynamics in forming, reproducing and dissolving social practices. The findings propose a more detailed analysis of the temporal demands of technologies and material devices in understanding the development of energy-intensive practices. Second, the study provides a detailed yet multifaceted empirical account of energy demand with a particular focus on wood heating. Domestic heating with wood is largely overlooked as a social and cultural phenomenon in the recent social science energy research, and as such it broadens the understanding of energy use as a distinctive engagement in everyday life. Third, and relatedly, this study not only focuses on the use of energy, but also on the domestic work done in keeping warm. Findings of the coordinating role of energy use help to conceptualise energy in relation to social practices for stronger policy implications. Finally, in deriving this account, the methodological choices of this thesis seek inventiveness by using diary material and treating diarists as 'everyday theorists'.

6.1 Theoretical conclusions

6.1.1 Multiplicity of material engagements

In the literature on social practices, it persists that the dominant understanding of the dynamics between practices and materiality is defined through the practicality of things or flows of materials. As the object of inquiry is a practice, materials settle into being treated as parts of practice-as-entities or practice-as-performances. By expanding the analysis from distinct things, such as freezers, to material arrangements and systems of provision, and by elaborating on the idea of materiality as a process of becoming, this study challenges this tradition,

and emphasizes the multiple, complex object relations of everyday life. It does so by providing an account of how things simultaneously exist as elements in a flat and dormant 'background', as dynamic components of ongoing action, and as sites and vectors of judgement and evaluation. The study explores how object relations evolve by recognising the forms of material engagement that are evidently not related to the ongoing enactment of specific practices and which resist and are opposed to coherent or rational narrative ordering, but which nonetheless constitute crucial aspects of everyday experience. In addition, the findings of the study points to how objects can be described or judged, and active or dormant, and by doing so, they broaden the theoretical understanding of practice-materiality relations.

These notions help to fill out an otherwise overly 'functional' view of things that concentrates on moments of use and utility, underplaying their uncertain, ambivalent and contested role in the conduct of daily life, and underestimating the overlapping and multiple temporal registers through which object relations are defined. Exploring the various ways in which material elements figure in everyday life gives a sense of how materiality switches between passive and active forms and provides an important reminder of the extent to which these relations reflect and reproduce forms of judgement and evaluation regarding the conduct of daily life and the social order as a whole. Materiality is far from being inert objects, but rather dynamic animators of the 'doing' of everyday life as well as generative of emotion and engagement. This is a central concern for those interested in the production of value, and in how objects come to be needed, desired and discarded. This also implies that exploring the ordering of technologies in everyday life is not to foster technological determinism, but to accept that, to an extent, technologies have momentum that is temporary and varies from context to context (Nye, 1999).

A broader notion of materiality can also be harnessed to distinguish how different practices intersect with each other. Recognising the different material characteristics of practices may direct studies to find interlinks between integrative practices, which are found in and constitutive of particular domains of social life, and dispersed practices, which are more dispersed practices such as describing, ordering and following rules (Schatzki, 1996). Appreciating the multiplicity and complexity of materiality may further challenge the process of defining practices, which is a central concern in sociology of consumption.

To further deepen the understanding of practice-materiality relations, a focal task is to broaden the discussion on the resource requirements of social practices. Perhaps the notion of 'things' as a rather ambiguous concept has helped practice scholars to dodge the question of how practices demand different resources, but for a stronger contribution to studies on sustainability, it may not be the way forward. For example, while practice theory turns attention to the demand for energy, it should not be taken to be indifferent in terms of the modes of energy provision but rather used to ask more questions on the very complex intertwinements of supply and provide. In the case of heating, this would mean to better acknowledge the scope of provision modes and its

distinctive and complex implications for users' roles, and the organisation of heating as part of the plenum of practices.

Materiality, in this sense, is conceptualised as constant process of becoming as it mediates both standardisation and localisation, and transformation and rooting of practices. This has implications for change as it shows that continuation and variation are not necessarily material, but the diffusion of skills and competencies is also crucial. Hence, the study entails that besides the challenge of making clearer distinctions within the material element of practice between arrangements, things, objects, and resources, making distinctions between the elements of practice is unclear. For example ideologies such as sustainability are being remade through materials, which implicates a vague cut between materiality and meanings. The study suggests a shift away from the individualistic idea of subject–object relations towards an understanding of objects in relation to practices. This view and this thesis in general contribute to a more dynamic view of the role of material in social practices. Humans encounter material, which is in the process of constant re-making, upgrading, and decay. Moreover, the flux of people and new material modifications imply that practices hardly settle. Rather, co-aligning and mutual influences between users and material are ongoing processes.

6.1.2 Underpinnings of flexibility in everyday life

One of the central temporal orders of technologies has to do with their flexibility. This thesis discusses flexibility as the relatively independent and non-contingent nature of material arrangements and also as the 'rhythmlessness' of their use. The notion of flexibility helps in unravelling the performance of material-temporal dynamics of practices, and paves the way for conclusions on the question of convenience (discussed under policy implications).

To more broadly understand the practical relationships in social practice, there is a need for transitional concepts such as temporality and materiality that describe how practices are embedded and enacted in time and space. This study points out that while time is already an important topic in various guises within social practice theory, it is less often acknowledged that temporally sensitive accounts of material engagement provide an understanding of how the hardware of daily life is situated in time, and how that situating is in part defined by the changing roles that objects play before, within and beyond moments of practical action. Furthermore, it is relevant to ask whether considering practices as consisting of elements including materiality, competence and meanings easily overrides questions of temporality. Bringing temporality more strongly to the centre of practice theories, either through the element of materiality or as a distinct category of analysis, may have the potential to make practice theory more informing.

The study implies that practices are most binding when they have a dense spatial and temporal organisation – a strong teleological structure – and when the materials are actionable and in use (Schatzki, 2010a). Hence, when the teleological structure is loose, practices or materiality are not binding but more open. This points to the flexibility of material arrangements, but also to the

ability of other elements of practice to be dormant and resurrected. This teleological structure is also indicative of the positioning of the practitioner. Many practices are linked to each other, but the practitioner may not consciously choose the bundle of practices he or she takes part in. Hence, for sustainable action we need to look beyond the individual and explore how practices stand out as a nexus in space and time, and produce coordinative succession.

As previous literature has discussed, inconsistencies, misalignments and inconveniences within and between practices are one way to think of change in the apparently stable everyday life. This study confirms the notion that while practices link, overlap and interact, practical action is seldom internally coherent. There are tensions as the tactical ways and skills of doing and coping may not match the rhythm of the day or available resources, and even when they do, they may not be consistent with the ways of strategic reasoning and moral judgements. Moreover, new technologies and knowledge intervene and challenge and bring existing routines into questions. However, with their stabilising momenta, practices succeed in bringing durability into social life. Inquiring into the dynamics of how flexible the social conduct is, how standardised and normative practices are, and what is the role of materiality in specifying performances, is helpful in evaluating the stabilising momenta. Grasping the inflexibility of practice and analysing its implications for sustainability requires that we look at the material arrangements critically, broadly and from the perspective of the ecology of materials, which acknowledges both the non-human and human matter, and the different positions of materiality in practice. While material configurations of practice include a wide spectrum of objects, some are more engaging, or focal, than others, and practices consequently centre life at variable intensities.

6.2 Methodological conclusions

This study utilises diary and interview data to account for the everyday experience of Finns in and around the practice of keeping warm. Two methodological challenges of theorising practices were recognised: first, the positioning of the observant; and second, the analysis of materiality in use in language-based method. Both these challenges relate to the conundrum of how practices are derived and defined from the ongoing performance of everyday life. Hence, the process of recognising and defining a practice, and the question of how and by whom it can and should be done, were focal methodological trials of this thesis.

Following an approach that gives the observant a more active role is well grounded for practice theory that theorises from the everyday. However, it seems that this is not a path that is often followed. A reason for this might be that energy research moves very close to the interests of policy-making, and the 'raw' domain of everyday life can appear as apolitical and irrelevant. It also seems to be a challenge for practice scholars to find a balance between non-structured and institutionalised data. All in all, these insights show that even

though practice theory is methodologically open, further discussions on the methodological choices are still needed.

The distinctive approach implemented in this study is to use a diary archive to turn citizens into ethnographers and theorists of everyday life. Free-form diaries offer rich accounts of everyday life: they tend to combine free-floating observations and aesthetic appraisals with pragmatic thinking and knowing. This leads us to value an archive that some might think of as volumes of insignificant detail. Even so, in exploring the dynamics of object relations and temporality of practices, the benefit of using diary data is that it provides a rich account of object relations that go beyond the pragmatic concerns of practice theory. Qualitative diary data provides a rich account of the everyday as experienced and reported by a vast set of 'ordinary' people, and shows how everyday doings enmesh with materials, aesthetic appraisals, inconveniences and troubles. By giving diarists and interviewees the role of everyday theorists, this study responds to the call of everyday life scholars to grant heightened attention to practitioners in their everyday surroundings (e.g. Thévenot, 2001). It also shows that it is possible to study practices and object relations not as pre-given entities, but as emerging in the everyday. The diary approach fits well with the methodology toolkit of practice theories, which is described as an open playground (Warde, 2005), and it accompanies the methodological opportunities that arise from the ontology of everyday life. As other studies have also reported (e.g. Halkier & Jensen, 2011; Martens, 2012), the distinctive elements of practice are rather easy to access as entities, but it is a challenge to grasp the enactments of practice as performances: it is easier to produce representations of entities than to grasp the actualised performances. Based on this study, I can only begin to raise the question of whether these performances are better grasped in language-based methods through the 'radical reflexivity' that everyday life scholars call for, and whether this radical reflexivity can be achieved by pursuing new ways of methodological inclusion.

6.3 Policy implications of the study

6.3.1 Relative convenience of everyday life

This thesis takes a practice theoretical perspective on domestic energy use. In doing so, it follows the emerging research approach in which energy use is explored in relation to the mundane social practices, such as heating, rather than approaching the question of energy use from a behavioralist or structural perspective. The study provides a detailed yet multifaceted empirical account of energy demand with a particular focus on a largely uncovered phenomenon of heating with wood. Heating with wood can be taken as a historically, culturally and socially 'rich' practice – something that coordinates many other aspects of life and that many people have grown up with. Especially in the Finnish housing stock, wood-based heating systems and practices often form the backbone on which more novel technologies are integrated. Hence, even though it is not a novel low carbon technology, wood-based heating gives insights for the

domestication and cultural ramp-up of other renewable energy technologies and thus matters for energy policy.

The analysis of rhythmicity and flexibility is one way to understand the positive appraisals of the inconvenient, laborious and physically demanding practices. The temporal structures contribute to the fact that people find domestic technologies such as wood-based heating to be both reasonable and meaningful, and even take pride and find virtue in using them. Wood-based heating creates rhythms in everyday life that are a source of joy and relief for people in the conditions of an increasingly flexible and interconnected global society. Staying warm appears as a very concrete accomplishment and a checkpoint that people work towards. Furthermore, pride, feelings of efficacy and satisfaction result from effective coping with the weather. Inconvenience is also tolerated if its role in time use is culturally accepted and taken as 'normal'. All of these facets sum up to explain why convenience is not always an overriding orientation for consumers. That the rather demanding practice of using solid wood for heating is on the increase signals that convenience and ease are certainly not the only routes along which distributed renewable energy technologies can proceed. Hence, understanding the constitution of relative convenience becomes central and extends the discussions beyond questions of general understanding of practicality as effortlessness, easiness and unnoticeability.

As comfort demands are changing with implications for resource use, it is important to reflect on how, for example, the different systems of provision, building design and regulations contribute to these developments. Large-scale heat provision delivers even temperatures throughout the day and seasons, escalating a development towards increasingly inflexible demand for indoor temperature. It follows that demand for heat is becoming even more inflexible, not only seen from the human bodily perception or the perspective of comfort but also in relation to the demand patterns of materials and technologies (Shove et al., 2014). This makes the so-called 22 temperature rule of a standardised and homogeneous indoor climate ever stronger in momentum, and means that the converging demands of comfort are increasingly built into the infrastructure and technologies, as the operating window – the range of temperature that technologies accept – is becoming narrower for many technologies. This anticipates increasing demand for cooling and heating. In terms of rhythms, this means that dwellers do not accept any rhythmicity from the infrastructure, but instead expect a flat, stable service of constant heat. Heating with wood, on the other hand, points to an occurrence where acquiring thermal comfort becomes more of an activity than a condition (see Shove, 2003). This urges us to understand the design as a flexible and dynamic achievement, rather than as an outcome of a closed script.

In comparison, a house with electric or centralised heating is short of these focal, centre-giving things, and rather marks the "central vacuity of advanced technology" (Borgmann, 1984). For customers of centralised provision, heating is not a dominant project in life. A laborious heating system would cause tensions if dwellers would not be willing and able to expand the labour power

and engage in heating work. In general, district heating has enabled people to disengage from their dwellings and given flexibility to diverse employment patterns. District heating fits well and is highly 'convenient' as compared to traditional wood heating in urban areas, and urban heating systems benefit, match and support the social and technical organization of their operating environments. However, for small-scale wood heating, the relations between practice, practitioners and non-human things are distinct, explicit and more locally graspable as compared with centralised production.

Moreover, innovations and new technology are often purchased to save time, but wood heating seems to point to a different perception of the value of time. While the convenience of new low-carbon technologies is an important purchasing criterion, the extent to which these technologies require human labour or limit flexibility in organising everyday life is difficult to judge by residents, potentially leading to disruptions and misalignments. *A priori* assessment can seldom account for the processes of mutual adjustment through which new technologies are fitted into the puzzle of everyday life, and furthermore, such an evaluation is equally difficult after a process of thorough domestication. From the perspective of proactive energy policy, it is important to highlight the little ruptures that emerge and exist around practices. It is critical to understand that these mundane ruptures do not resemble the kinds of changes usually associated with energy policy: it seems that the seeds of change bear more on home-woven opportunities and challenges.

It can also be argued that human practitioners are active agents of change whose pursuits are geared to saving resources, time and effort. While this is very obvious in terms of financial resources and human labour, Southerton (2003) and Shove (2003) have argued that contemporary practices can be understood as attempts to achieve convenience and enable increasingly flexible scheduling. If correct, apart from thinking about time only in quantitative terms, any fixed temporal patterning or rhythm in, for example, heating practice is also a 'cost', potentially problematic in everyday life, and thus likely to trigger or drive change.

Again, it seems that inconvenience is tolerated if its role in time use is culturally accepted and taken as normal. As also argued elsewhere (e.g. Isaksson & Ellegård, 2014), anchoring energy-related policies to the pressure points but also to the ongoing activities of everyday life is a possibility for policy makers, although this requires new thinking to move away from distinguishing production and consumption, and demand and supply.

For energy policy, where the emphasis is on energy efficiency and the promotion of new clean energy technologies, this study suggests that wood heating is an important backbone of new hybrid solutions and is relevant in exploring the ways new material elements, meanings and competences are introduced to the practices of domestic space heating. Whereas wood-based heating might be a speciality among renewable energy technologies, understanding its temporal order is useful for energy policy and the active dissemination of other technologies. In the face of socio-technical changes, it makes sense to question how new arrangements for heating fit into the existing

temporal organization of everyday life, and what kind of demands or work patterns the organization of heat imposes. Compared with large-scale systems of provision that pursue atemporal, constant service provision, more localized forms of provision are often visible, temporal and more flexible.

Debates surrounding distributed renewable energy technologies benefit from the notion that different forms of energy production and consumption, for example wood-based heating, are functional, act as organizing systems and provide feedback to users. Large amounts of technology, human work, coordination, skills and knowledge are involved and constitute taken-for-granted, proper and effective ways to stay warm. The strong commodification of energy through appliances, meters, programmes and eco-efficiency gadgets has the potential to make sustainable energy transitions easier, but they should be assessed in relation to the broader social practices they contribute to. To do this requires socialising and aestheticising the energy problem, but with strong material roots. Any new, low-carbon solution for domestic heating would appear to benefit from a storyline and a script of how people should and can act around it, as also argued by Spaargaren (2011). Wishing to increase resourcefulness, policy should focus on the characteristics of systems of provision that evoke direct experience and familiarity with resources, as also pointed out by Strengers and Maller (2012). Specifically, policy measures might want to note what needs are to be anticipated and planned, and what kinds of resources need to be brought together to make the system operate.

6.3.2 Everyday life as a policy target

Everyday life is a context of human creativity, innovation and change, and a site where processes towards a sustainable future might be initiated and nurtured. However, when fully acknowledging everyday life, we face the question of how policy can work with a world that cannot be defined and settled, as everyday life is indefinitely responsive. To answer this question is one of the promises of practice theories: the conceptualization of "temporally unfolding and spatially dispersed nexuses of doings and sayings" (Schatzki, 1996: 89) that seek to categorise and explain 'the (something)' that flees categories and explanations. Practice theory offers a lens for this terrain that is both critical and policy relevant at the same time. It has been argued that taking a practice approach to policy making requires a holistic view on social change, and daring interdisciplinary approaches (e.g. Shove & Spurling, 2013; Strenges & Maller, 2014). It is thus important to explore the possibility of politics that derives from user experiences and routes taken in the everyday life instead of a top-down policy making.

It remains that the dominant paradigm in policy and research is that the relationship between objects is merely practical. Striving for sustainable development through technological development seems to stabilise social institutions and continue the strong tradition of modernization. Approaching our surroundings and recognizing the environment in broader, more appreciative ways helps to think about environmental politics in a new way by defusing technological optimism and determinism. The limits of resources, or

the limits of nature if we wish, are factual, and living within their frame requires wit and thought that is not reliant on technology. Resources in this reasoning also become part of self-understanding and identity. This orientation to the material world requires voluntary and proactive politics that does not stretch and test the limits but understands them culturally.

Moreover, it persists that the role of practitioners in environmental politics is as residents who adopt concerns and solutions as consumers of resources. However, the remarks of this thesis help to tune the understanding of practitioners towards new ways of engagement as consumers and producers of services. As outlined above, in some instances, the achievement of staying warm or being able to enjoy heat from different sources on a cold winter day is important as such. It is thus the very action by which energy becomes consumed and not only the outcome or services that matter.

Some might find it unsatisfactory that the case of wood heating strengthens the argument that in everyday life, the connection between energy use and environmental change is difficult to make (Shove, 1997). This is despite wood being a rather physical and 'visible' form of energy use, and despite that consuming energy through the practice of heating is different from consuming it through other potentially more complex practices. Judging wood heating as sustainable or not sustainable is not the only task, but the task is also to see how it fits, fades and disappears into and from the fabric of everyday life. Wood heating at least teaches us about the importance of perceiving different layers in doings, and that these layers are temporal and material.

6.4 Limitations of the study

Certain limitations that characterise the study are worth deliberating. First, considerable weight has been placed on the material element of doings at the expense of other elements. However, this is justified not only because questions of sustainability are inherently material, but also because materials also carry other elements. For instance, ideologies of sustainability are embedded in certain objects, and 'technology' broadly understood include the skills and competencies of its use. Also, questions of affect, engagement, skills and meanings are closely related to the carrying out of social practices, and the way these practices engage with material arrangements. It is thus worth exploring whether we find or do not find answers to the defects of practice theory by following the route of materiality. Second, even though bodily engagement is central for wood heating and for many other social practices, the analysis has not approached the issue of how time and body interact, and accordingly the questions of experiential, affective and bodily elements of time remained largely untouched. This, however, may be taken to support the conclusion that further distinctions between the properties of different materialities are needed. Moreover, there is no thorough elaboration on the historical development of the trajectories of practices; neither is there exploration on the geographical, generational, and socio-demographic characteristics. For instance, we did not carry out a longitudinal or comparative study, but rather, the diaries as well as

the interviews merely offer a peek into the everyday, and the number of interviews was rather small. However, as the combination of interviewing, archival analysis and many other methods is necessary to pursue deeper theoretical questions (Lamont & Swidler, 2014), drawing from different sources makes this study robust. As noted by Shove et al. (2012), the lessons derived from theories of social practice are inherently limited by cultural and historical specificity.

6.5 Further research on practices and sustainability

The links between practice theories and sustainability are not clear or explicit; rather, they are a topic that calls for further elaboration. In their edited book, *Sustainable Practices: Social Theory and Climate Change*, Shove and Spurling (2013: 1) propose a stance that technological development is not sufficient, but rather they suggest that mitigating and adapting to climate change "requires profound changes in what people do – the challenge is of imagining and realizing such versions of (normal) life that 'fit in the envelope of sustainability'". This is a focal task, and to a degree practice scholars have indeed imagined other versions of everyday life by, for instance, questioning the developments in showering and understanding of hygiene (Shove, 2003), discussing how modern technologies such as the freezer have changed daily life (Shove & Southerton, 2000) and challenging the policy goals and measures for building on certain (behaviouristic) paradigms (e.g. Strengers & Maller, 2014), to name just a few. However, there is a lot to be done here – bolder takes on what sustainable practices would look like and how they could be realised – as much as needs to be done to develop understanding of what 'the envelope of sustainability' accounts for in theories of practice.

Energy provision depends on critical resources, such as oil, coal and biomass, which all modern societies are dependent on and tightly bound to. Paradoxically, however, societies simultaneously build on a strong growth paradigm and struggle with finding and implementing ways for revolutionising the energy economy. The question at hand is how to organise societies to support sustainability, and most urgently, there is a call for efficient ways to tackle issues of climate change. There will also be an inevitable societal and political discussion and experimentation on whether societies aiming at sustainability should accept and be more open to ineffectiveness, inconvenience and slowness. These issues not only have implications for policy-making, but also for our understanding of materiality, technology and temporality in social analysis. Importantly, in thinking about what sustainability 'requires', we as researchers, policy-makers and practitioners can start asking the same questions as I did with wood heating in relation to other heating arrangements and other practices: What is the materiality that a sustainable home longs for? What kinds of rhythms do sustainable homes favour or reject? What kind of diversity is the use of different energy sources embedded in, what kind of action does it allow? How flexible should the practice be for a better 'possibility' to be sustainable, and what types of path dependencies can we accept? What kind of space

requirements do we produce when we develop technology? These questions all relate to the call for more in-depth understanding of the everydayness of energy technologies, the dynamics between the old and new technologies, and the role of technology as an ordering act in the everyday. They also contribute to the call for building theory that is appreciative and sensitive to social change.

The promise of practice theory in understanding energy use and its conceptual toolkit lies in its ability to help in unlearning conventional ways of thinking, drawing attention to overlooked things while recognising obstacles to sustainability. It is clear that those who take social practices as the central unit of enquiry, and who are at the same time interested in specifying and promoting societal transitions in response to unsustainability and climate change, are not short of demands for things to think about.

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Object Relations in Accounts of Everyday Life

Jenny Rinkinen
Aalto University School of Business, Finland

Mikko Jalas
Aalto University School of Arts, Design and Architecture, Finland

Elizabeth Shove
Lancaster University, UK

Abstract

Theories of social practice routinely acknowledge the significance of the material world, arguing that objects have a constitutive role in shaping and reproducing the practices of which daily life is made. Objects are also important for those who approach 'everyday life' as an ontology, a tradition in which scholarly interest in the material reaches beyond the somewhat pragmatic concerns of practice theory. In this article we identify traces of both schools of thought in the ways in which people describe their immediate material environments. By drawing on an archive of diary material, we illustrate multi-faceted object relations with reference to the example of keeping warm. We conclude that in keeping warm, diarists weave together encounters, tactics and judgements, encountering objects in ways that extend beyond the 'mere' enactment of social practice. In analysing these encounters we explore ways of conceptualising the object-world that are especially relevant for studies of everyday life.

Keywords

diary archives, materiality, object relations, social practice

Introduction

Understanding how things, day-to-day practices and practitioners are mutually co-aligned is a core concern for sociologists of everyday life. Theories of social practice have recently entered this field, bringing with them a new emphasis on the constitutive

Corresponding author:
Jenny Rinkinen, Department of Management Studies, Aalto University School of Business, PO Box 21230, 00076 AALTO, Helsinki, Finland.
Email: jenny.rinkinen@aalto.fi

role of objects. Following actor network theory (Latour, 1992), materials and social arrangements are frequently analysed together on the grounds that both are implicated in the emergence, the enactment and the reproduction of everyday life (Shove et al., 2012).

In contrast to those who study the culturally and symbolically significant surfaces of objects, practice theorists contend that the social significance of material objects lies in the ways in which they are 'handled' (Reckwitz, 2002a: 210; Reckwitz, 2002b), in how they are mobilised in practice and how they combine in practice-arrangement nexuses (Schatzki, 2010). Ingold (2008, 2012) takes these ideas a step further, suggesting that analyses of material culture should focus less on the 'objectness' of things and more on the material flows and formative processes through which they come into being. This writing focuses on things in use, recognising that usefulness is always in flux, that it depends on how objects relate to each other, and how they are integrated into one or more practices. In keeping with these ideas, Warde's proposition that consumption happens not for its own sake but as part of one or another social practice establishes the ontological standing of goods as elements of practice (Warde, 2005). More detailed work highlights specific forms of object-engagement such as maintenance (Gregson et al., 2009) or construction (Watson and Shove, 2008). Relations between objects have also been considered, as in Hand and Shove's (2007) analysis of the freezer as an orchestrating node around which multiple aspects of consumption and provision converge. In combination, studies like these generate convincing and compelling accounts of the dynamic relation between practices and materiality, but in concentrating on aspects of function and flow they tend to overlook the many other parts things play in daily life.

As Schatzki notes, the ways in which people discuss and act towards objects are not exhausted by questions of use: 'People also observe objects, examine them, measure them, admire them, draw them, and talk about them in numerous ways that do not pertain to use' (1996: 114). These modes of engagement are not somehow apart from the conduct of practice, nor are they 'purely' symbolic. This has been acknowledged in sociological inquiries. For example, Durkheim (1915) notes that sacred objects have a special role in religious rituals; Goffman (1967) and later Collins (2004) recognise the social significance of objects in more mundane forms of human interaction; and in the field of consumption, writers like Douglas and Isherwood (1980) and Belk (1988) analyse the fluid status of objects as they are produced, consumed, exchanged, appreciated and categorised in aesthetic, emotional and economic terms (see also Becker, 1974, 1982). Yet, to date, and with a few exceptions (e.g. Appadurai, 1988; Engeström and Blackler, 2005), there has been relatively little discussion of how these multiple object relations are reproduced in everyday practice.

One method of catching sight of the complexity of object relations is to review ordinary people's accounts of an ordinary day. In this article we examine co-existing forms of practice-object relations with the help of a body of solicited diary data created through two successive calls in which volunteers were invited to document an ordinary day. This diary-keeping exercise was organised by the Finnish Literature Society and took place in 1999 and again in 2009. In working with the resulting archive of diary entries we look for theoretical insight – and not 'just' documentary evidence – regarding relations between things, practices and the constitution of everyday life. In other words, our method is to treat the diarists as 'everyday theorists' and to tap into narratives that reveal

complex and yet distinctive methods of conceptualising the parts things play in the reproduction, the experience and the reporting of the everyday.

In brief, our ambition is to review empirical accounts of everyday life to see how object relations are represented. We limit our analysis to descriptions of keeping warm on a cold day. Within the diary data, the sayings and doings that relate to staying warm stand out as a broad category not only of practical activity but also of feeling, tradition and evaluation. Other topics might have worked as well: we do not claim that the practices of staying warm are in some way unique, nor do we suggest that this case gives us access to all possible forms of object relations. Rather, we use this theme as a focal point for an exercise in discerning the multiple, dynamic and co-existing roles of things within and beyond matters of practicality and use (Ingold, 2012).

In working with the Finnish diary data, and in harking back to the French tradition of everyday life studies, we hope to enrich social theories of practice and contribute to an understanding of object relations within the sociology of everyday life. In detail, the article is organised as follows: we begin by discussing the use of diaries and their relevance within theoretical traditions that treat the everyday as a particular ontological category. We then say more about the texts to which we refer, the modes of material engagement they represent, and the insights that can be drawn from these lay accounts of object relations. We conclude by reflecting on the wider implications of our analysis.

Using Diaries as a Method of Conceptualising and Representing Everyday Life

Scholarly practices frequently imply and just as frequently reproduce a division between elite intellectuals on the one hand and lay people, who are the objects of study, on the other. Although this tendency has been noted and deliberately resisted, for instance by Garfinkel (1996), academic researchers claim to have a privileged view of social processes and of social order. The tradition of everyday life studies challenges this paradigm. It does so in that scholars operating within this field aim to provide methods and conceptual frameworks that are capable of accounting for the everyday world as that is seen, understood and enacted by lay people. This is not an easy task. Indeed, some argue that established research methods are always lagging behind and always too selective to grasp more than a fraction of the richness, the complexity and the fleeting character of the everyday (Highmore, 2002; Sheringham, 2006).

Whilst the immediacy of daily life might elude researchers in pursuit of stable, rationalist accounts, it is not necessarily immune to all forms of representation. Put bluntly, methods of registering the everyday depend on recognising and not resisting these necessarily provisional features (Pink, 2012). As Highmore (2002: 171) explains: 'the singularity, the here-and-now-ness of everyday life requires invention in a variety of ways […] for making the everyday vivid, of rescuing it from an undifferentiating scrutiny'. For this, De Certeau (1984) suggests a range of techniques: foregrounding and revealing the absence and occultation of the everyday; recovering textual remains; and recording detail. Diaries constitute one such method (Lefebvre, 1947), and have been widely used in this role (Crang, 2005; Sheringham, 2006). Similar to lay utterances, patchy, sporadic diary entries represent theorising that has its starting point in first-hand experience of the everyday.

Diaries, along with other literary genres, are potentially capable of bringing small details to life (De Certeau, 1984; Highmore, 2001), uncovering the self-evident and revealing repetition and sameness (Lejeune, 2009). While diaries have been used to capture the mundane, the taken for granted and the recurrent qualities of day-to-day life, they have not, as far as we know, been used as a resource with which to problematise or reveal the role of things. Before embarking on such an exercise we briefly review the problems and benefits of working with diary data in this way.

Using Diaries in Research

Diaries take many forms, ranging from unstructured personal accounts to more organised texts produced in response to specific 'directives'. In addition, there are established research traditions in which people are invited to keep diaries of travel, of weather or of health, and in which the resulting data are aggregated and analysed for different purposes (Alaszewski, 2006). Diaries also feature in studies of human geography (Meth, 2003; Morrison, 2012), and in feminist research – a field in which there has been further discussion of diaries as tools of self-reflection and empowerment (Jokinen, 2004; Stanley, 1995).

In these, as in other settings, diary writing is governed by a range of conventions, one of which is the *regularity* of observations. This stems from the ambition of detecting and recording longitudinal changes; for example, in one's health or in the environment (Oliver, 1958). Although we work with one-day diaries, many entries are informed by this tradition. A second generic feature of diary keeping is its *privacy*. Diary writing provides opportunities for personal reflection and development and for expressing thoughts which are not for sharing, at least not immediately. Insofar as the diarist is personally inscribed in the diary, rules of self-presentation affect the text, and probably do so whether there is an intention to publish or not. A third tendency – which is for diaries to foreground the materially and emotionally proximal (Lejeune, 2009) – underpins their emphasis on the familiar, the habitual and the intimate (Highmore, 2001: 15). Finally, diaries often follow the same narrative structure, typically starting in the morning, sometimes outlining plans for the day, then coming to a close with the evening and with thoughts that drift on to other topics or to far-off places.

It would be misleading to say that diaries provide authentic access to real life or that they are free from systems and structures of representation (Latham, 2003). The details that diarists provide are often inconsistent, patchy, partial and fragmented. This is not surprising; after all, their lay authors are not bound by scientific conventions, nor are they (usually) under any obligation to make reliable observations. In addition, and since diaries are necessarily singular accounts rooted in the conditions of their production, much is lost when they are read and interpreted out of context (Meth, 2003).

When viewed from the perspective of the French tradition of everyday life studies, these are not necessarily negative features. Instead, the fact that diaries are frequently ambivalent or that they represent events and moments in terms which fall outside dominant discourses and rationalities is something to be valued. In these respects, diaries are especially useful in revealing experiences that are always emerging and always uncertain (Sheringham, 2006). In addition, and again following De Certeau (1984), various commentators argue that the purpose of enquiring into the realm of the everyday is not

to preserve it, but rather to (re)invent it: diary writing is thus seen as a generative and productive endeavour in its own right.

Having commented on the qualities of diary material in general terms, we now introduce the documents on which this article is based. We make use of an archive of one-day diaries written by ordinary Finns in response to a call from the Finnish Literature Society to document a single day, 2 February: first in 1999, and again in 2009. Unlike the UK Mass-Observation directives, both calls were very open: participants were simply invited to write about 'The Day of the Finn'. There were no further guidelines about what to describe or to whom the writing should be addressed. The diaries submitted in response exemplify all the conventions outlined above: personal reflections and accounts of special projects exist alongside detailed reports of the weather, of natural phenomena, of the respondents' immediate surroundings and of social issues.

We approached this data set by reading a selection of entries. Our first selection of approximately 8000 diary pages was guided by an interest in descriptions that were in some way related to the ambiguous notion of energy. This led us to collect extracts and vignettes relating to a variety of activities including heating, showering, cooking and climate-related observations (see Jalas and Rinkinen, 2013). To be more precise, we read 7300 diary pages from the 1999 material, and wrote down 391 vignettes. From the 2009 material we read 1000 pages, and wrote down 160 vignettes. The quantitative imbalance between the two years reflects the smaller size of the 2009 data set (11,503 compared with 23,500 entries), reflecting the fact that this second round was not as widely publicised. There were also differences in how diary entries were indexed, meaning that the 1999 call was easier to work with. For purposes of the present discussion, these features are not significant in that we do not compare the two years. We treat the diarists anonymously and refer to the extracts with numbers: the numbering of the diaries in 1999 is made by the archive, the numbering of the extracts from 2009 is based on our own records. The preliminary exercise of identifying and recording energy-related vignettes was followed by a further round of selection and reading in which we concentrated on entries that dealt with the practices of heating the home (approximately 150 vignettes). This second step highlighted the significance of materials and of object relations, which is the topic to which we now turn.

Materiality and Temporality in the Diary Archive

In discussing diary entries, we distinguish between three co-existing modes of material engagement. Before introducing these modes we begin with two general observations. First, although the diarists write in very different ways, the diary format clearly structures the manner in which materials and object relations are represented. Diarists tend to foreground the micro-situatedness of the everyday. In so doing, many write pragmatically, recounting the events of the day by explaining what happened when and how. At the same time, the diary genre provides licence for more reflective narratives, and for commenting on those same events in depth and in a more intimate manner. Texts often switch between matter of fact reporting and thoughtful commentary.

Second, diarists hold different temporalities of material engagement in tension. The sameness of everyday life and its rhythmic quality underpins an anticipation

and appreciation of the known and the familiar. Although continuity is presumed, descriptions of the day are typically fragmented: episodes are presented with little reference either to spatial context or to factual temporal sequence. In general, diarists do not provide elaborate causal narratives, nor do they stray far beyond the immediacy of the moment. Things simply exist – and are simply engaged within the responsive, instantaneous 'time' of the everyday (Highmore, 2002). And yet it is evident that responses, or in De Certeau's terms, tactics of coping are established *over time*, and, as such, call for a temporally extended, somewhat historical analysis (De Certeau, 1984). In selecting events, observations and ideas that are worth reporting, diarists are actively engaged in positioning practices and their elements in some temporal and spatial frame. In addition, diarists are, of necessity, involved in sharing knowledge, experience and evaluations with some future reader (Lejeune, 2009). In these various ways, and almost despite itself, the diary format situates the events of the 'day' within a longer time frame.

These generic features co-exist alongside three distinctive modes of representing the object-world. Our reading of diary entries on the topic of heating and keeping warm led us to identify descriptions in which diarists (1) encounter the object-world, (2) act in a materially constituted world (carrying out practices) and (3) evaluate the object-world. All three modes are widespread, they are not unique to one diarist or another, and they often co-exist within diary entries – and even within the same vignette. In what follows we use selected excerpts to illustrate these modes and to suggest that each represents a temporally distinct way of relating to objects.

Encountering the Object-World: The Weather, the Heating System, the Firewood

> It is almost midnight. The wind howls in the corners and in the ventilation pipes ever more loudly. The snow blowing over the roof has piled on the windowsill up to half-curtains. It is wonderful to think of sneaking underneath the blanket. Inside the heat of the oven is level. (SKS KRA, 1999: 42463)

Descriptive texts like this revolve around the perception, recognition and naming of entities. Diarists operating in this genre list the people, places and things that form and fill their day. Some of these accounts resemble Charles Perec's extreme attempts to capture the everyday through the repeated cataloguing of objects in urban spaces (Perec, 1989; see Sheringham, 2006). More commonly, such texts consist of seemingly neutral inventories of what the author sees in situ, and in the moment. There is no reference to memory, no attempt at narrative integration, and no ambition to do more than record what is 'there' (Crang, 2005). And yet these descriptions are unavoidably analytical: each item mentioned is an item that for one reason or another counts as something that is worth a mention. This significance often relates to some causal or diagnostic connection. In other words, items are referred to because they are thought to be relevant in identifying and perhaps explaining other phenomena.

As in the excerpt above, and also in general, emotional or sensual thought figures as a particular form of self-observing, as when people comment on their preferences or simply state that they like some things. In accounts of this nature there is an element of

distancing from the practicalities and problems of everyday life, a feature which highlights the point that this mode of material engagement is simply not action oriented.

As well as describing the material world, documentary accounts sometimes refer to the author as an element in the scene that is represented. This does not necessarily mean that humans are granted any special agency or purpose in what remain characteristically blank forms of reportage. In the next extract, the diarist comments on the wear and tear on his/her body as if this was just another part of the system of heating:

> After four o'clock I harden my mind. The frost has hit minus fourteen degrees, but one has to drag oneself to the wood pile. My back is not agreeing with this and the fingers get cold, but the remaining firewood is of such a size that it needs to be chopped. I manage to make half a wheelbarrow of chopped wood and get an idea to heat the sauna. (SKS KRA, 1999: 41200)

Even though authors refer to things that are merely present-at-hand, they are not entirely indifferent to the objects they describe. They can be evaluative and point to aesthetic and other virtues (and vices) but the point is that they do so without reference to particular uses, affordances or human interests:

> The frost meter indicates 21.5°. The radio confirms the degrees. I glance at the fireplace, put more wood in and enjoy the radiating heat. My eyes follow the play of the flames and I recall the many number of camp fires in the woods. FIRE is after all the best of all inventions. (SKS KRA, 1999: 42341)

In this mode of encountering the object-world, there is an ever-present, but implicit, spatial emphasis on proximate things such as the frost meter. Descriptions of this type are confined by a sort of 'activity-place space that is a matrix of places and spaces where activities are performed' (Schatzki, 2002: 43). The temporal frame is just as constricted. There is no mention of what Schatzki (2002: 45) refers to as forms of 'prefiguration' – that is, of how present material arrangements make future combinations easier or harder to achieve – and no mention of history or of causation. Descriptions are characteristically matter of fact, and in the present:

> It's cold inside. I place logs in the stove and a matchstick in the curly birchbark, porridge water in the pot, and morning coffee in the kettle. […] The kitchen warms up, the porridge water boils. The day can begin. (SKS KRA, 2009: 96)

> Being at home I usually heat with wood and the electric radiators can cool down. When the fire was going well I felt so drowsy I went to lie down on the bed. (SKS KRA, 2009: 17)

> Reading a book I noticed that the living room was quite cold and I put woollen socks knitted by my daughter on top of a thinner pair. (SKS KRA, 2009: 31)

Like the flux of street-talk to which De Certeau refers (1984), this mode of writing represents a form of haphazard and random documenting. As such it is perhaps best understood not as a representation of personal mental processes but as a particularly open

way of being-in-the-world, and as an essentially aesthetic form of expression. This suggests that aesthetic orderings might encompass residual bits and pieces that do not fit into more purposeful schemes and categories of practical action. Alternatively, we might conclude that this mode of encountering the object-world allows us to catch sight of material entities not as entities that act, but as the 'media in which living things are immersed, and are experienced by way of their currents, forces and pressure gradients' (Ingold, 2008: 212).

To reiterate, in this kind of object-oriented writing, things are observed and named but descriptions of action, logical reasoning and moral judgement are only tentatively present (Thévenot, 2001).

Acting in a Materially Constituted World: Coping with the Cold

Accounts of practical, ongoing and responsive problem-solving represent a second mode of material engagement. Within social theory, practices are integrative structures that delineate the means and process of doing, and that simultaneously reproduce proper and desirable ends, aims and orientations (Schatzki, 2002). Diarists' descriptions of acting in a materially constituted world reproduce this double orientation. Materials consequently figure as tools required for the enactment of specific practices, and as instruments that can be handled in variously effective ways. On both counts, material surroundings are noted and noteworthy because they are actionable.

When operating within this more pragmatic tradition, diarists write about how to do things and how to handle objects so as to meet the 'standards' of the practices in which they are engaged. Not surprisingly, economic and practical aspects come to the fore in reports in which people describe methods of keeping warm. The following excerpt exemplifies this approach:

> Frost appears to be –26C. I point out to my man that it is wise to connect the car preheating [electric heating of the engine], because he intends to drive to the city. […] I light up the fireplace, the wood is already in there. Dry, warm wood lights up easily. We enjoy breakfast. I go back to bed and read the newspaper. My man goes to light up the boiler of the central heating, so that the house would be warm, now that there is the small baby. I stand up to add wood to the fireplace. (SKS KRA, 1999: 41978)

In this case, there is a lot of planning and causal explanation. Heating systems are needed to make other things possible (getting the car started) or to make people comfortable (particularly the baby). Things are described in a synchronised, sequential manner following the series of actions in which they have a part. These deliberate actions are, in turn, organised around pre-defined goals; for example, remembering to dry sticks in the oven so that it is easier to light the fire the next day.

As described below, the outside weather, and particularly the cold air, creates specific demands, mattering for how practices are enacted, sequenced and coordinated:

> In the morning the meter showed 15 degrees frost, so it was a proper day for baking and cooking. (SKS KRA, 1999: 41694)

> I put the dishes into the machine, and it is full since there was already some from yesterday. I can set the machine running to get hot water to the drain. (SKS KRA, 1999: 42214)

> After getting up [from a nap] I clean out the ashes from last night, get a basket full of logs from the cellar, and stack the fireplace ready for the next fire. (SKS KRA, 2009: 78)

Schatzki (2001) and Warde (2005) contend that pre-existing practices-as-entities are reproduced and transformed through repeated doings and sayings and recurrent performances. The diarists' accounts quoted here are consistent with this view, and with Bourdieu's claims that the world of practice is a world already populated by procedures to be followed and paths to be taken (Bourdieu, 1990: 53). In writing about what they do, diarists mobilise understandings of competent action within pre-existing material and social conditions. Sometimes these accounts focus on inconvenience and trouble, or on how problems have been confronted and solved, but in other cases all goes well: the pieces of the daily jigsaw slot into place. In these situations, agency, materiality and shared conventions mesh (Thévenot, 2001).

When writing in this mode, diarists write about reciprocal relations between objects and humans. Material elements call for, carry and preserve forms of practical competence. Practical competences are initially craft-based, embedded and locally reproduced but as practices (and related materials) become more widely shared, related competences stabilise, sometimes to the point that they can be defined, taught and learned regardless of the situation (Shove et al., 2012: 50). In focusing on how practices are enacted, some entries represent a form of peer-to-peer user instruction and, as such, play a role in keeping knowledge in circulation (Shove et al., 2012; Thévenot, 2001).

Practice-theoretical studies of how daily life is reproduced and enacted in an always-changing environment refer to dynamic processes that characterise ongoing sequences and chains of action (Southerton, 2006). In writing about how they 'play the game' according to pre-existing rules, and about how they excel and 'score' in everyday life, diarists show themselves to be knowledgeable and strategic actors within the ends delineated by their habitus. In the most positive of these accounts, things are skilfully mobilised within a seamless flow of effective action, taking their place in the smooth running of everyday life.

Evaluating the Material World: How Heating Should be Done

While some diary entries are full of confidence others are riddled with uncertainty, also reporting on strains, tensions and outright conflict about how things should be done. Tactical ways of doing and coping do not always correspond to shared understandings of how life should be lived. There are, in addition, situations in which new materials or forms of knowledge disrupt existing routines and throw established habits out of kilter (De Certeau, 1984). Moreover, every method of handling the practical details of daily life is linked, in some way, to broader conditions and consequences. These challenges underpin the mode of evaluation and implicit judgement OR this mode of evaluation and implicit judgement evident in the diary data.

This mode is given expression when diarists justify or question particular practices and uses of objects. In this kind of writing, accounts of practice (for instance in the form of peer-to-peer talk and 'user instructions') invoke or refer to an evaluative framework. Descriptions of how to keep warm are consequently presented and situated in terms of an understanding of proper 'standards'; for example, of comfort or frugality (Thévenot, 2001).

Such engagement is not aesthetic; it is not a matter of explaining how to do things, nor is it a disinterested description of how things are. Instead, accounts are infused with normative evaluation, affirming or challenging the worth of specific practical-material arrangements or of entire ways of living. Judgements of good and bad do not relate to private matters of convenience, ease or joy but instead refer to the wider conditions and consequences of the action. In short, this mode introduces the public eye of a 'generalised other' (Thévenot, 2001).

Evaluative reflexivity implies critical distancing from one's own action: in the diary material, judgements reflect a variety of distant concerns including family traditions, the wider society or animal welfare. On the other hand, reflexivity can also prompt people to think again about their own practices, preferences and values. The following train of thought, separated by commas, flows from the details of the moment on to broader questions about how to stay warm and how to lead a proper life:

> The digital watch of the VCR shows 02.20, already next day and I do not feel tired any more, night is quiet, frost behind the windows, cold, I have wool on me, the electricity of the machines warms, from lamps, does it come from nuclear or coal, I would rather live in the little red [ochre] cottage and grow my food, eat less e-codes and be more, and more naturally, part of nature, ever-lasting longing for countryside after having spent my childhood there. (SKS KRA, 1999: 297)

In this extract and the next, reflexive thought and judgement are meshed with documentary-style observation typical of the first of our three categories of material engagement. In the following passage, the diarist observes the room and his own body and mind with a seemingly free-floating spirit:

> The day is turning into night. I look at this room. There is a lot to improve. Hundred years old house, fireplaces in the corners. Friends have been kind and fetched firewood from the basement that is so difficult to access. The firewood is piled in front of the fireplaces. The system for heating the water does not work, has not worked for the past year. And again today I have not decided anything about fixing it. I would like to think of this as a stance on consumption demands, continuous growth, maximisation of profit, the irreversible division between rich and poor. This is how I would like to think, but I wonder if it is just sloppiness. (SKS KRA, 1999: 461)

However, this description is evidently not disinterested: the history of the house seems to matter, people matter as friends, personal characters of integrity and initiative are endorsed. These evaluations depend on an understanding of how things should be, and of practical actions that should be taken. Whilst some comments refer to arrangements within the home, others concern bigger issues including the functioning of the market and related themes of equity and justice. In addition to this movement between social and

spatial scales, objects travel from background to foreground and back again, as illustrated in the following extract:

> I light up an old Siro-stove (model number 52) manufactured by Högfors. The stove gives a lovely cosy feeling. In winter time like this the fixed electric radiator (from 1972) takes care of the heating of the kitchen. I move to the dining room of our 110-year-old house, and make a fire out of logs in the original 'pönttöuuni' [a type of stove]. The height of our rooms is still 3.4 metres and the stoves too are 3.2. There's a lot to be heated in winters, even though we also partly use electricity … . When the ignition seems to succeed, I move to the hall where I do the same tasks. (SKS KRA, 2009: 8)

This mode of evaluation and implicit judgement revolves around what MacIntyre describes as the internal value of a practice (MacIntyre, 1984). In short, practices sustain and reproduce specific understandings of what it is to do them well. In so far as practices entail the use of objects, forms of material engagement are woven into the normative framework of the practice itself (Thévenot, 2001). As indicated above, practices are not approached in isolation but are instead linked to more abstract and more strategic questions concerning the structural conditions of social action. In this way the diarists remind us that the practicalities and materialities of daily life are enmeshed in webs of moral judgement.

Object Relations: Insights and Conclusions

We started with the idea that accounts of everyday life might provide insights and understandings of how materials, practices and practitioners intersect. Our typology – arising from the diary data and from diarists' encounters with things in the world – is useful as a means of promoting and provoking developments in theories of social practice and in the sociological understanding of everyday life. It is so on five counts. First, in detailing the various ways in which material elements figure, our analysis gives a sense of how object relations switch between passive and active forms, and provides an important reminder of the extent to which these relations reflect and reproduce forms of judgement and evaluation regarding the conduct of daily life and the social order as a whole.

Second, our scheme echoes diarists' representations of a world which consists of useful, meaningful and actionable objects-as-tools, on the one hand, and of a more passive material milieu on the other. The latter 'environment' is not organised around actual or possible human–tool combinations, nor does it simply consist of dormant elements waiting to be used. It is nonetheless implicated in what people do. In general terms it is clear that 'The physical compositions of humans, artifacts, organisms, and things of nature […] structure what actions can and might be carried out when, where, how, and for what ends' (Schatzki, 2010: 137). However, it is difficult to determine when and how this kind of pre-configuration occurs or to establish the direction it might take. In writing about how objects switch from latent background to foreground and back again, the diarists describe object-worlds that are constantly in flux, indicating that the emergence (and disappearance) of practical tool-type relationships, and of identifiable modes of pre-figuration, are themselves outcomes of the ebb and flow of social practices.

Taking this point further, a third contribution is to highlight the relation between the unknown, the named and the practical aspects of objects. This is a central concern for those interested in the production of value, and in how objects come to be needed, desired and discarded. There seems to be something of a sequence in which objects are initially named (and thus drawn out of the background); in which they become associated with other things and/or with human actors; and in which these associations contribute to more organised chains of action, and to the practical accomplishment of certain valued ends. Conversely, the process of falling out of use appears to be one in which links are eroded or fractured, but in which terms and labels endure for a while longer. Understanding how these bonds are made and broken depends on understanding the emergence (and dissolution) of relevant communities of practice; that is, of groups of people who have some shared understanding of the 'value' of an object, typically related to an also shared capacity to use it/integrate it in practice. Of course some might argue that objects 'create' homogenised collectives and communities of practice around themselves (Wenger, 1998). Either way, it is important to understand how such communities bring object relations into being, and vice versa.

Fourth, diarists' accounts tend to focus on tasks and projects involving the use of many objects at once: they only rarely deal with one object at a time. This is indicative of the actual co-existence of objects and the structures of usefulness and justification that exists around them. In highlighting this feature, the Finnish diarists remind us of the fact that practices are enacted in a world of tools and objects that move in and out of immediate 'usefulness', and that are simultaneously significant as potential resources for future projects and/or as currently redundant remains of past endeavours. In approaching objects in the plural, diarists provide further insight into how things are drawn out of the background (in which they figure as part of the context or environment), how they become topics of immediate attention, and how they sink into the background again. In Ingold's words, 'everything may be something, but being something is always on the way to becoming something else' (Ingold, 2011: 3). As the diarists demonstrate, in the world of materials, nothing is ever complete: materials are thus substances-in-becoming (Barad, 2003: 822). They carry on, overtaking the formal roles that, at one time or another, have been assigned to them.

Finally, in writing about encountering, acting in and evaluating the object-world, diarists inadvertently draw attention to the different temporalities of material engagement. This is a theme that deserves more explicit attention within social theories of practice, and within studies of everyday life. To elaborate, when diarists report on their encounters with the material world they report on a world in which objects appear to be *stable* – they are present-at-hand – suggesting a form of *a-temporality*. In such accounts, objects appear frozen in time and space, as if caught in a photographic snap-shot. Sometimes there are hints that objects have an active life but, for the most part, diarists writing in this mode rarely refer either to the past or to the future (Beyes and Steyaert, 2011). By contrast, accounts of things in action emphasise both the flow of events and the need for sequencing, synchronisation and temporal coordination. When describing causes and consequences, diarists move back and forth in time, extending the temporal scope of their account well beyond the moment of doing. Practice-theoretical studies do the same: analysing the lives of practices as they unfold over time, and describing the responses

and actions of practitioners (those who do) within the ongoing flow of daily life. Finally, those whose accounts are more overtly judgemental move between seemingly universal, atemporal descriptions of how things *should be*, and more specific evaluations of a particular action or event.

In various guises, time is an already important topic within social practice theory. There has been some discussion of time either as a resource on which practices depend or as something that is made by and through the recurrent enactment of different practices (Shove et al., 2012; Southerton, 2013). Rhythms, sequences and synchronisations are critical in characterising the timespace of practices (e.g. Jalas and Rinkinen, 2013; Shove et al., 2012; Southerton, 2013), and in accounting for their development (Blue, 2013). What is missing, and what the diarists' temporally sensitive accounts of material engagement provide, is an understanding of how the hardware of daily life is situated in time, and how that situating is in part defined by the changing roles that objects play before, within and beyond moments of practical action.

In conclusion, in describing ways of keeping warm on a winter's day, the diarists reveal a range of co-existing but nonetheless distinct modes of material engagement. In this article we have drawn out these lay theoretical constructs, and drawn attention to their relevance for theoretical development within the social sciences. For sociologists of the everyday, this exercise underlines the centrality of object relations and of their temporal reach: in this it shows that the realm of the everyday is not simply a realm of immediate experience. For theorists of social practice, it provides a more subtle and a more complex account of how material arrangements play out in practice. It does so by recognising forms of material engagement which are evidently *not* related to the ongoing enactment of specific practices and which resist and are opposed to coherent or rational narrative ordering, but which nonetheless constitute crucial aspects of everyday experience. In addition, it provides an account of how object relations evolve and of how things simultaneously exist as elements in a flat 'background', as dynamic components of ongoing action, and as sites and vectors of judgement and evaluation. This helps fill out an otherwise overly 'functional' view of things which concentrates on moments of use and utility, underplaying their uncertain, ambivalent and contested role in the conduct of daily life, and underestimating the overlapping and multiple temporal registers through which object relations are defined. On all fronts the diarists encourage us not to settle on static schemes and categories, but to focus on the multiplicity of co-existing object relations and to think about how temporal frames swing into and out of view.

We end with a note on method. Diary collections such as the one we have used effectively turn citizens into ethnographers, valuing and archiving what some might think of as volumes of insignificant detail. For us, the very unstructured nature of the diary-writing process proved crucial. If diarists had been given more direction, and if the Finnish Literature Society had sought to make the diary process 'useful' for research, it would have been difficult and perhaps impossible to map genres and styles of representing object relations or to 'see' the various modes of engagement to which these styles relate – and on which much of our theoretical insight depends.

This brings us to our own role. In working through the diary material, and in sorting it out, we have come up with a three-part scheme, distinguishing between modes of encountering, acting in, and evaluating the object-world. We have been able to use this

scheme to some effect, identifying gaps, pointing to new agendas and providing fresh ways of thinking about how people, practices and things interact. Nonetheless, some might accuse us of squashing rich accounts of daily life 'into discrete enclaves of activity and reflection' (Highmore, 2001) and ironically disregarding the complexity and disorder on which our 'analysis' depends. A first response is to reiterate the point that our three-part scheme is a device with which to expand theoretical understanding of object relations in practice. A second is to underline the point that the categories with which we have worked are indeed arbitrary, leaky and co-existent. We have used brief extracts to illustrate and exemplify differences between modes of representing and relating to things but in most of the diaries writers move with ease between passages of 'flat' documentary description, practical talk of doing and coping, and reflexive judgement.

In switching between different 'voices', diarists are engaged in various forms of involvement and presentation of self. Not surprisingly, those who write about practical projects and accomplishments frequently present themselves as competent, clever and thoughtful actors capable of managing the challenges of daily life and of providing useful advice to others: in short, doing and evaluation are never far apart. In addition, it is important to remember that diary writing is a process in its own right. The business of documenting and cataloguing the experiences of the day often prompts reflection and evaluation of one's own routine. These features, along with endless inconsistencies, make the diary data what it is. They also make it a useful resource, allowing us to catch sight of how material objects and social practices hang together.

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Jenny Rinkinen is a PhD Candidate in the Department of Management Studies at Aalto University School of Business. Her research focuses on material and temporal dimensions of social practices in understanding the dynamics of energy demand.

Mikko Jalas is a Senior Lecturer in the Department of Design at Aalto University School of Arts, Design and Architecture. His research focuses on time use, materiality and everyday life and their implications for sustainable consumption practices.

Elizabeth Shove is Co-Director of the DEMAND research centre (Dynamics of Energy, Mobility and Demand) and Professor of Sociology at Lancaster University. Her recent research has been about how social practices change and about the implications of these dynamics for everyday life, energy demand and climate change.

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Paper 2

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Stacking wood and staying warm: Time, temporality and housework around domestic heating systems

Mikko Jalas
Department of Management and International Business, Aalto University School of Business, Finland

Jenny Rinkinen
Department of Management and International Business, Aalto University School of Business, Finland

Abstract
This paper presents a study of the socio-technical ordering of time around wood-fuelled heating systems of detached houses. It analyses the sequences and rhythms that organize the work of domestic heating, its synchronization with other daily activities, and tempo as the subjective experience of time in these activities. The study is based on a large, pre-existing Finnish free-form diary collection. We suggest that domestic energy technologies become useable and useful through the gradual embedding that involves the temporal organization of everyday life. As a result, technologies that organize time are not only convenient in an invisible way but also act as taken-for-granted coordinates and rhythms of human pursuits in everyday life. In many countries, wood-fuelled heating systems remain a common renewable energy technology in detached houses and stand as one option to lower related carbon emissions. However, the broader use of wood is compromised by time and convenience.

Keywords
Time, temporality, heating systems, housework, household consumption, renewable energy

Corresponding author:
Mikko Jalas, Department of Management and International Business, Aalto University School of Business, Helsinki, Finland, Aalto University School of Business, PO box 21210, FIN-00076, AALTO, Finland.
Email: mikko.jalas@aalto.fi

Introduction

Practical-theoretical approaches into domestic energy consumption (e.g. Gram-Hansen, 2011; Guy and Shove, 2000; Hargreaves et al., 2010, 2012; Nye et al., 2010; Shove, 2003) address technical systems as being contingent to routine action and highlight the ways that energy systems are reasonable, convenient, operable or acceptable in everyday life. However, only a few studies address the active work of providing heat and indoor comfort and these seldom consider the synchronization of activities (see however Gram-Hansen, 2011; Hitchings and Day, 2011; Petersen 2008; Shove, 2003). Furthermore, and despite specific attempts to focus on post-installation situations, studies of novel technologies such as photovoltaics and smart meters seldom reach the level of routinization that emerges as technologies are gradually ingrained into the fabric of everyday life (e.g. Hargreaves et al., 2010, 2012; Keirnstead, 2007). Thus, whereas the home as a site of diverse energy-related practices is increasingly policy-relevant, only a limited number of empirical accounts address the everydayness of energy-related socio-technical systems as taken-for-granted non-novelties.

Thermal comfort has been suggested as a means to look into the everydayness of domestic energy use (Shove, 2003). Hitchings and Lee (2008) further argue that this notion bridges the layers of technology of human encasements. Thus clothing, housing and the natural environment form an integrated practical unity against which the human body is negotiated. However, much of this research has focused on (the emergence of) mechanical cooling (e.g. Chappels and Shove, 2005; Hitchings and Lee, 2008; Shove, 2003) in which the technology is rather invisible. In the case of wood-based heating in cold climates, the technology is highly visible (Petersen 2008). This also implies that negotiations not only concern acceptable indoor temperatures, but also the practical efforts required. Analysing heating work thus opens up quite a different view on thermal comfort because comfort is not regarded merely as an expectation but as an achievement and thus a field of work in its own right.

In this paper we use the notions of practice and work to provide a qualitative study of domestic wood-based heating. Our main research question concerns the way that technical systems order everyday life and create organized temporal patterns of human activity. We draw on Lauer (1981) and Zerubavel (1985), and particularly the concepts of periodicity, sequence, synchronization and the tempo of time that Fine (1990) has developed on the basis of these references. Southerton (2006) also serves as an important benchmark as he has applied these concepts to household activities. We contribute to this literature by highlighting the socio-technical structuring of time as opposed to previous overtly sociological accounts.

Domestic technologies are frequently introduced as time-saving conveniences but do not always deliver convenience. On one account, the division of housework between genders and descendants changes, and new expectations arise and supplementary tasks are needed (Schwartz Cowan, 1983). Thus, people adapt to changing conditions in a way that makes sense to them, but which can seem irrational in terms of cost, energy or time-saving (e.g. Nicol, 2011), and often this adaption is

undergone subconsciously (Schwartz Cowan, 1983). In terms of heating, convenience may be displaced by the importance of hearth-like focal points of heat, especially due to their sensory and affective facets (Devine-Wright and Wrapson, 2013; Petersen, 2008). In this paper we suggest that instead of, or aside from, considerations of convenience, heating work is justified by the very rhythmicity of the work involved.

The primary empirical material we draw upon consists of pre-existing diaries in which people have been asked to document one particular day, 2 February 1999 and 2009. With these two calls, Finnish ethnologists received altogether more than 30,000 diaries that document everyday life across the country in different social groups. In the preparation of this paper we have read through approximately 1000 diaries of adult Finns, of which about 150 deal with wood-based heating. In addition to these diaries, we also draw on a small number of interviews of detached house owners and farmers that were conducted between 2010–2012, and on Finnish time-use survey data.

The article proceeds as follows. We first introduce the temporal structuring of everyday life as our conceptual framework. Thereafter we present the empirical data and the methods of analysing diary data. In reporting the results, we firstly give an overview of the technical arrangements of wood-based heating systems and thereafter use the diaries to consider the temporalities of human action in the operation of these systems. We conclude with the considerations relating to the socio-technical organization of time as well as implications relating to the promotion of low-carbon energy technologies in the domestic setting.

Temporal structuring of everyday life

The structuring of time takes place through different mechanisms. Orlikowski and Yates (2002) and Zerubavel (1985) emphasize the structuring role of devices such as institutionalized, and collectively accepted, calendars that mark qualitatively different time. Southerton (2006), on the other hand, places greater emphasis on the active coordination between people. Our empirical focus on solid-wood heating systems underlines the way that the reoccurring maintenance and operation of technical systems structures time, and how this apparently technical structure also reflects the natural annual and daily cycles as well the socially negotiated expectations of comfort. We introduce sequence, periodicity, synchronization and tempo as key aspects of the temporal organization of human activities that have been developed by authors working on the sociology of time (Fine, 1990; Lauer, 1980; Southerton, 2006; Zerubavel, 1985):

Sequence is the priority and order of the tasks in a workflow (Fine, 1990). This can also be thought of as the flow of events in a material sense. For example, acquiring and drying firewood occurs before using it; acquiring being an absolute necessity and drying being a requirement of competent and acceptable use. Shove et al. (2012) refer to this kind of sequential and tight coupling of different activities or practices as practice complexes.

Periodicity signals the repetitious intervals in which sequences take place. While some sequences re-emerge multiple times every day, others are repeated less frequently. Periodicity is partly a physical characteristic of technical systems since it depends on the buffers of material and energy that can be stored in and by these systems; but it may also depend on a thoroughly social rhythm such as a weekly sauna. Nevertheless, these kinds of intervals and the repetitious nature of everyday life allow for a routinization of sequences. They also stand as a proxy for future activities, and thus underlie the efforts of planning and synchronization (Southerton, 2006).

However, periodicity also has another important effect. It reflects and responds to a general modern pattern of separating work and leisure. This pattern not only exists between paid work and private life, but also within the latter. People hurry with tasks and errands in their private life in order to create less harried moments of leisure (Hochschild, 1997; Southerton, 2006). The periodicity of, for example, solid-wood heating creates repeated slots of time for working on a specific task and thereafter enjoying the benefits of this work such as having dry wood for the winter or more narrowly a fire in which to pause in front of. Indeed, Lauer (1980) originally used the notion of rhythm, which signals a rather more positive image than that conveyed by periodicity.

Synchronization refers to the mastering of a set of temporal sequences (Fine, 1990). Restaurant cooks, as in Fine's example, know approximately how long each dish will take to prepare, and organize their work for concerted results. On a different level, the docking of a large ship requires the temporal coordination of many different sequences of work (Hutchings, 1993, cited in Shove et al., 2012). More broadly, because synchronization connects activities that are not in the same sequence, it relies on clock time as a medium of coordination (Levine, 1997) and is most overtly sociological (Fine, 1990). Although the most vivid examples of synchronization relate to organizations, domestic life is not devoid of clock time, 'right timing', scheduling and planning (Hochschild, 1997; Southerton, 2006; Zerubavel, 1985). The work of harvesting firewood might for example require the matching of labour of multiple people, proper machinery and the right weather conditions, which requires both planning and improvisation.

There is also a more mundane notion of synchronization that relates the overlapping of different sequences in the form of 'multitasking' and to polychronic rhythms (Nansen et al., 2009). This aspect seems of ultimate importance in terms of the smooth running of everyday life: the logistics of firewood take place conveniently if and when other errands can be performed simultaneously; as an example, the lighting of fires is not seen as a burden if it takes place while the coffee brews in the morning. Rather than the planning and orchestration of work in organizations, mundane synchronization is about the flexible combination of tasks (Barnett and Shen, 1997) and constant switching between tasks (Nansen et al., 2009). Thus it has both a spatial logic – doing multiple things while in one location – and a temporal logic of filling time slots with mutually compatible activities (see Shove et al., 2012). While multitasking is, in the literature

on housework, typically treated as a strategy by which to cope with excessive demands, and associated with stress and strain on the mechanisms of psychological control, the mundane simultaneity of tasks is an outcome of routinization.

Tempo indicates the rate or speed of the activity. The notion of tempo builds on the distinction between experienced, qualitative time and objective time that is one of the most regularly discussed topics addressed by social studies of time (Orlikowski and Yates, 2002). In work environments, tempo can be felt as a rush to compress the normal duration of activities, as boredom or, in the optimal sense, as the smooth flow-like running of work that was a prominent way to talk about one's work in the kitchen environments that Fine (1990) studied. Striking a balance between having too much to do and too little to do is a related occupational concern. As we will later report, when describing their domestic life, people take 'professional' pride in fitting many things into a single day and in running the day effectively with the help of both plans and improvisation. However, in domestic settings there is also scope for being satisfied with a very low tempo of activity or stillness (Highmore, 2004) that seems to be absent in organizations.

To recap our conceptual framework, we understand sequences as tightly coupled sets of consequential activities that may be spatially or temporally distributed, but remain as a whole as causally, physically or normatively tied work processes. Periodicity refers to the rate of reoccurrence of activities or sequences and, as one particular type of reoccurrence, to the rhythms in which socio-technical systems require maintenance and replenishment. Synchronization indicates a looser coupling as different sequences meet or are purposefully brought together in time and space. In addition, we suggest that synchronization can be understood both as the planning and orchestration of sequences, and as the mundane, improvised simultaneity of tasks in everyday life. Finally, tempo refers to the rate of activity and is a parallel phenomenon to synchronization: the fact that planning and multitasking sets sequences into mutual relations also creates pressures of due delivery, questions of right timing, as well as empty moments of forced idleness. Such temporal ordering of everyday tasks in the domestic setting is never complete and thus there are opportunities to benefit from improvisation and for idleness beyond instrumental reason. Aside from this however, convenience technologies also proliferate, undo established rhythms, create flexibility and promote an on-going improvisation in everyday life.

Data and methods

Examining the temporal structuring of everyday life implies a need for different methods that range from mechanically analysing the flow of people and material objects to the capturing of emotional states such as stress and boredom. For example, Fine (1990) first elaborates on the external conditions of restaurant work including the daily and weekly cycles of business and holiday as well as availability and logistics of foodstuff. His analysis of kitchen work reflects these

conditions but is based on extended participant observation and on in-depth interviews that are used to bring forward the experience of time during the workday. Southerton's (2006) empirical work is based on a different methodology; semi-structured interviews in which he brings respondents to reflect on issues such as general time pressure in society and to recount their own recent days. This choice of method seems apt for at least two reasons: In his research setting there is less need to elaborate on the external structures of time because he deliberately focuses on discretionary activities. Furthermore, instead of the technical and natural structuring of human conduct, Southerton's research focuses on the normative expectations of how practices should be conducted.

This paper puts more emphasis on the socio-technical structuring of time and draws on various sources of data. To begin with, both authors are experienced users of the heating systems that we describe. In addition, for the purposes of previous studies we have conducted 14 interviews with rural households, some of whom had suffered from winter-time electricity blackouts and some who had been identified through a community wind-energy project. This preliminary understanding is expanded with a solicited diary collection, prompted by the Finnish Literature Society in 1999 and 2009. The collection consists of one-day free-form diaries with no specific guidance on what or how to write – the call was merely entitled 'The ordinary day of the Finn'. The broad call in newspapers was highly successful: altogether, 23,500 diaries were archived in 1999 and 11,503 in 2009. Of these, 19,000 and 7,900 diaries, respectively, were written as a school assignment and are not included in our analysis. Despite this however, more than 8000 diaries of adult Finns were available. The diaries document the course of two days, Tuesday 2 February 1999, which was a very cold winter day, and Tuesday 2 February 2009, which was a mild winter day in a record warm winter.

Free-form diaries are accounts of everyday life, typically personal texts with different aims ranging from the mere recording of activities and observations, through to thorough self-reflection. In research, solicited diary texts are taken to offer snapshots of particular social spaces, and embodied and emotional practices in the making (Morrison, 2012). In studies on housework, formal time diaries are in frequent use. However, as far as we know, free-form and non-prompted diaries have not been used to study domestic heating practices or energy use more broadly (however, see Hitchings and Day (2011) on thermal comfort).

Diary data serves two different roles in our analysis. We use the data to extract details of the organization of heating work beyond what is available through the technical description of heating systems and firewood logistics. These details include the question of when, by whom and in conjunction to what other activities heating work is performed. As such, diary data enables us to take a more detailed view on the meshing of activities than perhaps provided by interviews and thus serve as a proxy for participant observation. Secondly, diary data offers us views on the experience of time. While the first analytical task is descriptive, analysing the experience of time is interpretive. We have operationalised the task of analysing the experience of time with three considerations: (a) unexpected conditions and failure

in coordination (see also Southerton 2006), (b) descriptions of idleness, and (c) flow of effectively coordinated activities across time and place.

The diaries range from half a page to 30 pages in length. We randomly read through 1000 diaries: 3100 pages from the 1999 collection and four archiving boxes from 2009. We extracted 350 excerpts that related to heating or indoor thermal comfort and a further 158 that relate to wood-based heating systems. These excerpts varied in length from a few sentences to whole diaries. Following this process, the excerpts were re-read from the point of view of the temporal structuring of wood-based heating. No quantification of the number of papers engaging in a particular theme was undertaken. Rather, our analysis summarizes the ways that respondents operate heating systems, cope with the related demands and achieve comfort during cold winter days.

Living with solid wood-based heating systems

Previous studies of domestic wood-based heating systems

Despite their on-going prominence as heating technologies, there are markedly few studies of the use of firewood in domestic settings. However, two important observations can be made based on the previous studies of solid-wood heating systems. Firstly, these systems imply both active human bodies and the active management of the demand for thermal comfort. Historically, the heated living space within the house has been adjusted based on fuel availability (Lindmark and Andersson, 2010) and heat provision has been infused with other domestic tasks (Nowakowski, 2011). Modern woodstoves can suit highly standardized indoor comfort expectations – as Petersen (2008) reports, a wood stove might be acquired to level off a small variation in indoor temperature. Yet, the way that the papers dealing with contemporary systems (Devine-Wright and Wrapson, 2013; Nyrud et al., 2008; Petersen, 2008) argue that the aesthetic and sensory appeal of fire and heat radiation is of great significance to the users hints that active management of thermal comfort and adaptive expectations are also component parts of modern systems.

Secondly, the previous studies of domestic use of solid wood are inconclusive in respect to the importance of convenience. Nyrud et al. (2008) studied families in the greater Oslo region who had recently received a government subsidy to substitute a modern wood stove for an older one. The overall satisfaction of the survey respondents with their investment had a clear negative correlation with the time and effort needed to run the system. However, the Petersen (2008) study provides a different picture: his Danish interviewees reported in a positive manner the array of related activities and range of sensory experiences available through the active involvement of using stoves. Moreover, the active work required by these systems raises the questions of when, where and by whom is the heating work undertaken: Offenberger and Nentwich (2009) for example claim that the spatial arrangement of wood-based heat provisioning can be understood from the point of view of gender categories. In their reading of the marketing material for wood stoves, decorative

and aesthetic fires stand apart from the rationally managed, masculine and technical boiler room.

These brief observations have served to orient our own empirical analysis. We continue by sketching the technical and material background to the efforts reported in the diaries. This background information consists of our own pre-understanding, some physical facts pertaining to wood-based heating and a technical description that can be extracted from the diaries. After creating the background, we devote further consideration to the diaries and turn to analysing the active management of solid wood-based heating systems and the temporal structuring of everyday life around them.

Contemporary solid wood-based heating systems

In our research context, solid wood is the traditional way of heating buildings during the cold periods of the year from October through to April. A significant share of the stock of detached houses in Finland has been built with such heating systems as the primary source of heat, and almost all of them have a fireplace or a stove that enables wood to be used. Furthermore, in more than 25% of the 1.1 million Finnish detached houses, solid wood is still used as the main source of heat (Statistics Finland, 2010). The use of wood has actually increased by 20% between 1994 and 2008, and accounted for 40% of the energy content of fuels and electricity used in detached houses in Finland in 2008 (Torvelainen, 2009).

Solid wood, while a prominent source of heat in detached houses, presents challenges in terms of convenience. Albeit that central boilers and various technologies for transferring heat have entered the housing stock, wood is also used in fireplaces, tiled stoves, cast-iron stoves and baking ovens.[1] Furthermore, while central boilers have reduced the number of fires to manage, the spatial separation of the dedicated boiler room has created new problems of monitoring. As such, it remains that all of these ways of using wood for heating purposes require coordinated human action (pellet technology is surprisingly absent however, even in the diaries from 2009).

Systems for burning solid wood imply large volumes of raw materials. A normal detached house using wood as a single source of heat consumes roughly $20\,m^3$ of stacked wood, which equates in weight to roughly 8000 kg of dried wood.[2] In a heating season of 200 days, one thus carries and combusts on average 40 kg of wood every day, and during cold spells this amount doubles. However, the management of this material flow has not been a primary objective of housing design. This means that wood-based heating requires physical abilities that some people, for example the elderly, may lack.

The ability to store both heat and batches of wood dictates the intervals of heating activity. In our diary data, a large-volume tiled baking oven is still the common solution for storing heat and thus improving the convenience of heating. However, at the same time, a baking oven requires the maintenance of two different stocks of firewood of different sizes. In terms of convenience, the development of hybrid systems is important. Wood, even when it is the primary source of heat,

is seldom the only available choice. Cheap electric heaters offer back-up systems and enable flexibility; however, when other heating systems dominate, fireplaces are only used to provide extra heat and comfort during cold spells.

Sequences of harvesting, hauling and heating with wood

The harvesting of firewood usually takes place during the winter season when the moisture content of a tree is low, the wet ground is frozen and has snow-cover, and poles and logs remain clear of dirt and can be easily transported to road connections. When no obstacles exist, harvested logs and poles are cut and chopped soon after. The drying processes for wood are often very traditional: first, chopped wood is gathered in loose piles outdoors in sunny places, and later transported to a sheltered place and piled more densely before the rainier season. The folk saying 'firewood needs to see two mid-summers' further specifies the process.

Many of the households that have wood-based heating systems are able to source wood within their own property, from other non-commercial sources or as the leftovers from commercial forest operations. However, the lots may be located at a distance, in conjunction with summer cottages, at inherited plots or available through relatives located elsewhere in the country. Hence, in the diary material, many respondents report making journeys of many hours to obtain wood from places that are removed from their houses.

The equipment involved in acquiring wood is, as a minimum, a chainsaw. However, sourcing wood as the primary source of fuel frequently requires managing heavy loads of poles and logs. Consequently tractors, snowmobiles and cars with trailers appear in many diaries, as part of harvesting work. The temporality of the human body is evident as the diarists seldom engage in full-day harvesting, but rather work in episodes of a couple of hours or perhaps half a day on a more remote site. However, most of the reports of harvesting work show both joy and pride and a feeling of efficacy.

Most of the firewood is stored in unheated shelters. The easy lighting of wood requires that it is brought inside in advance. In the diary material, we meet residents who heat their baking oven every other day and stock it with wood in the day between the fires, or stock the oven in the morning and light it in the afternoon. A similar pattern in the daily use of smaller stoves, kitchen ovens and fireplaces is to stock them the previous night.

The following excerpts illustrate the sequences of harvesting, hauling the wood and heating:

> *At 10:20 I straighten myself up and light up the central boiler, fuelled 2/3 with wood and 1/3 with lump peat. The lump peat is damp after a rainy summer, even too damp and icy. Probably half of the heat energy goes to drying! The wood that was chopped in May is almost dry. The firewood is sourced from our own forest 24 kilometres away or from closer, clearing the logging areas in others' forests. Sourcing firewood is mainly a healthy functional exercise. An elderly man like myself has to be careful not to hurt*

himself. Logging requires skills and strength, and one needs to keep cool. (SKS diary 1999/42469)

My daughter does the dishes and is off to carry wood. She carries many armfuls to cover the needs for the next day. I keep thinking that it's time to go the woods [the husband has left earlier]. . . . With a billhook I walked past the shed, popped in and took an armful of wood for the oven. I take them to the house and get the oven ready. I light it when I get back from the woods at 13:30. The stove is hot all day. It's the most important source of heat in our whole household. I clean up the stove . . . We only burn birch in the oven so it's ok if some remains stay and even sticks to the bottom of bread. (SKS diary 1999/39965)

Making the actual fire depends on having dry-enough wood and a proper draught in the chimney. The diaries however record little difficulties in establishing the fire. The work also includes stoking the fire, the control of the damper, and eventually the removal of ashes from the fireplace when a convenient time arises. The excerpt below connects with the annual cycles of sourcing as well as the minutiae of solid-wood heating:

Have you already made the fire? – my wife calls from upstairs. I reply a bit dishonestly: I am about to it. I stack firewood that we made the summer before last at Karkkulampi into the oven. I crumple old newspaper in between the wood. I fill the whole oven and light it, and then I go and open a small window. Opening the window is important, because the house has mechanical ventilation that creates low pressure. One must therefore take in additional air so that the smoke goes out of the chimney and does not come in from the hatch. Soon there is a humming noise and blinking light behind the glass of the hatch. Live fire is nice to watch, so I drag a stool next to the fire and watch. The heat of live fire is also cosier than electric heat. I then go and get a basketful of firewood to get it warm for tomorrow. The wind of the North-East and the crisp frost feel on the face and on my ears. [goes out]. I return home quickly to get warm. The fire is almost gone. I stoke the glowing cinders with a hook. My hands and face start burning. Great feeling. My wife hears me from upstairs and asks: Shall we put the food in the grill. I answer: It is noon so it is time. I only watch over this fire. (SKS diary 1999/39319)

The central boiler is often lit in the morning as a first work shift prior to paid work. The same applies with the baking oven. However, the baking oven, if it is used for cooking purposes as well, requires that the fire is first made up and then that the ashes or burning remains of the wood are removed from the oven. In many diaries, the oven is lit before leaving to complete other tasks, and baking takes place only after they are completed.

Periodicity and buffering of heat, wood and work

Periodicity refers to the rate of reoccurrence of tasks or sequences. In wood-based heating, the annual and bi-annual work of harvesting and drying wood is one of the

basic rhythms. The daily and weekly rhythm is created by the ability of the heating system and the ability of the house itself to store heat. In the diary material, the daily heating of central boilers is the norm, albeit that, during cold spells, a good night's sleep requires that in many cases boilers and ovens are also lit in the evening. Baking ovens appear as being more effective storage devices and are reported to extend the benefits of heating over multiple days (see note 1). In addition to the buffering of heat, flexibility is also created by carrying wood indoors from the outdoor shelters. In the diaries, this work is scheduled by weather conditions and by a social rhythm of providing and receiving help from others.

The statistical time-use survey data reported in Figure 1 is indicative of quantity as well as the rhythms of this activity. While the average for this work lies between 8 and 14 min per householder, wood is a primary energy source in only 25% of detached houses, and thus in those houses the daily workload is likely to be much higher. More importantly for the present paper, the uneven weekly distribution supports at least two claims: (1) the heating systems with their technical and behavioural buffering capacities allow for the planning and distribution of work over more than a single day, and (2) heating is a socially shared convention that follows an arbitrary weekly cycle. The main heating days of Finns appear to be Monday, Thursday and Saturday. Starting from low levels of activity on Sunday, the week unfolds. Saturday is a day of intensive heating, as is Monday. Friday is beginning to be seen as the second sabbatical of the week (Brembeck, 2012) and, plausibly, this makes more work for Thursdays.

While the heat storage capacity of the system contributes to flexibility and allows longer periods of absence, this very ability also creates demands. In the

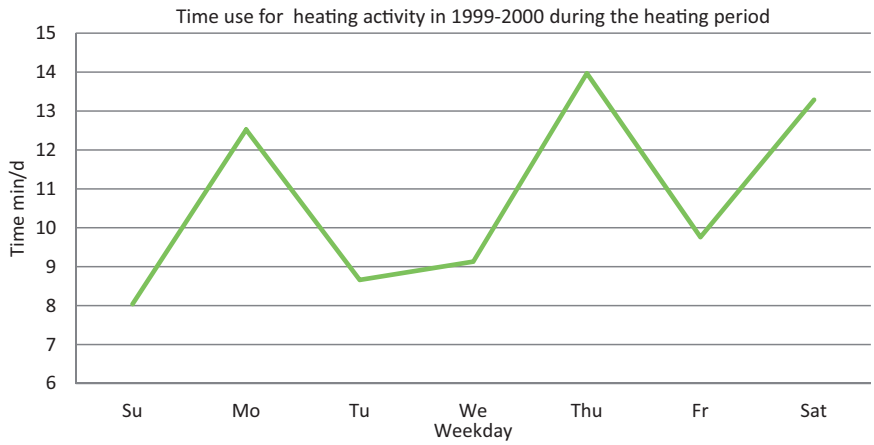

Figure 1. The average daily time (min/d) spent on heating and water provisioning in the period from October–March by individual Finns living in detached houses (Source: Statistic Finland, 2001).
x axis amend to Sunday Monday Tuesday Wednesday Thursday Friday Saturday.
y axis amend to Time (min/d)].

excerpt below, a grandmother declines an invitation and stays home to heat her ovens *in order to* be absent for a couple of days to come. Wood-based systems and detached houses thus force their residents to plan, manage and accumulate heat in order to respond to anticipated needs of absence and flexibility.

> *The girls [granddaughters] ask if I will stay overnight with them, I can't at the moment, I have to stay at home for the heating of the oven, as I leave tomorrow for a three-day trip (SKS diary 1999/42461)*

On a longer timescale, stocks of harvested and dried ready-to-use firewood provide a buffer for unexpected events. As one of our interviewees contends: if something should happen to him at least there is dry wood in the house for a couple of years. Curiously, stocks of wood appear as a form of personal insurance or savings. Wood as a material allows for people to work in a more self-sufficient manner and, due to the low material costs of this activity, also enables these households to build up buffers that can be used to increase the flexibility and security related to domestic heating.

Synchronization and multitasking around wood

Heating work needs to be fitted in with other tasks. Beginning with the annual scale, the harvesting of firewood is often a stand-alone activity in the diaries with little evidence of explicit multitasking. However, multiple benefits of this work are reported. Since the forest or the existing stock of dry wood may be in a remote location, journeys to make or fetch firewood emerge as a mixture of necessary toil, outdoor exercise and leisure travel. In many cases, it is also the joint efforts of more than one person, unlike most of the other heating-related tasks. Even if no particular health concerns exist, spouses, neighbours, friends and relatives are also called upon to perform the work of harvesting and to bring in necessary machinery. When harvesting is part of commercially-aimed forestry, firewood is harvested in conjunction with thinning operations. In general, of all the tasks related to wood-based heating, harvesting work is the one most often carried out as an orchestrated and planned activity (c.f. Fine, 1990) and the only one that seems to require the use of the calendar and fixed appointments therein (c.f. Southerton, 2006).

Inside the house, cooking is one of the prominent conjunctions in which heating co-occurs. Wood stoves in the kitchen are lit as a routine activity with little elaboration, but also more specifically to prepare hot meals during cold days. In the case of the baking oven however, the logic might be reversed: on a cold day, the baking oven needs to be heated, and because of this, a particular course for the day and selection of food follows. The use of the baking oven can span a three-day rhythm of first stocking the wood, then heating the oven, and then allowing the heat to attain a level to suit a particular cuisine. Despite this long duration, the synchronization with other aspects of everyday life does not seem to cause problems.

As Fine (1990) argues, effective synchronization is a sign of professional competence, and this seems to apply also to the work of heating.

Heating work meshes with the various needs or situated benefits that indoor heat yields. These are more specific than mere thermal comfort. Visitors are treated to heat (see also Hitchings and Day, 2011); heat is also needed after hard manual work and the consequent need to dry clothes and get clean. Furthermore, heating is a labour of love. On a cold day spouses, both men and women, frequently welcome their significant others home with the act of heating the sauna.

If fireplaces, stoves and ovens are located in living quarters, managing the fire appears not to be a burden: diarists might for example make the fire while the coffee is brewing. Dry wood and a good routine stand behind this image of almost 'switching on' the fireplace or stove. In opposition to this, centralized heating is more problematic in terms of synchronization as shown below:

> *At eleven o'clock I rise and lumber to the boiler room. I stop at the door: the room is deathly silent and the air control is open. Didn't the damn thing light in the morning? I gauge the thermometer and my head records the figure of 40c as I open the hatch. A few cinders glow in the empty boiler fire place. It has burned a full load of wood in two hours. Molok mouth! [Moloch is a biblical deity requiring a constant fire and the sacrifice of children therein] . . . [Later during the day the same thing happens] I try to attend the heating, but after ironing and preparing batter for crepes the fire has again used all the wood. (SKS diary 1999/42336.)*

Work, 'the janitor shift', in the boiler room thus has a very clear and coercive temporal structure since people aim to keep the fire going. While there are exceptions (for example the case of a small child who accompanies his grandfather for a shared joy), for most diarists the boiler room is rather a burden. They wake up at night and drag themselves into the boiler room to feed the fire.

Quite obviously, the use of a central boiler room is based on routines and expectations that do not function as usual on 2 February 1999 because of an extreme cold spell. This raises the question of the resilience of the technical systems and the routines of their operation as opposed to changing weather conditions. In the diary material, people have different relations to weather. They observe it, prepare for and anticipate it, and enjoy the physical effects of it, but also fall prey to unexpected and exceptional weather conditions. In other words, weather is another facet of mundane synchronization: it stipulates activities, alters rhythms and suggests proper times for many activities among which heating and fuel management is central during winter time.

Tempo: rushing to stay warm and pausing in front of the fire

Tempo refers to the subjective experience of time as being more or less full of activities. The above quote about the boiler room given above signals the stress and inadequacy that can be experienced in domestic tasks. However, multitasking

can also result in positive emotions and feelings of competency (Offer and Schneider, 2012) as shown below. In the following description, the flow of effectively coordinated activities across time and place stands out:

> *I step out of the cow shed into the bright morning around 10.00 o'clock. I get a handful of firewood for the kitchen and a large bag of wood for the tiled ovens of the living rooms. The husband has brought in the logs for the baking oven. I clean up, change clothes and eat breakfast. I light up the fireplace and the tiled ovens in two living rooms. I call my mother-in-law and ask her when I should take her to the doctor. I notice that I have time to begin the cleaning of the house. There I go, carpets of living rooms and the bed linen to air outside, sheets to the washing machine, vacuum cleaning, wiping of dust and washing of the floors, and four rooms have been cleaned. I warm up the fish soup from yesterday and we eat. I take a quick shower, hop in the car and drive 7 km to the village centre where my mother-in-law lives in a terrace house. (SKS diary woman/2009)*

In his research on professional chefs, Fine (1990) claims that days with too few demands were frustrating for the chefs. However, this is not to exclude the joys of slowness in the domestic setting. In contrast to the need to remain effective in the workplace, in domestic settings people (in the diary excerpts) enjoy the low tempo by taking naps, watching TV, or reporting on what they see when gazing out of the window. Regarding heating work, a diarist may in a more or less ad hoc style go out to make firewood in a hobbyist manner. Some households even report that more wood gets chopped than can be used. An even more frequent pastime around heating is simply to sit for extended times in front of the fire as detailed below:

> *With this frost, the walk must be skipped. Instead, I heat up the fireplace. Actually, the house is heated with electricity, but one fireplace is left. That is a pleasurable moment for me and the dog. I sit on a small stool in front of the ember with Ville [dog] on my lap. I talk to him and we are both satisfied. (SKS diary 1999/1386)*

In previous literature on housework, most of the indications that relate to tempo are signals of time squeeze such as multitasking, the fragmentation of activities and the shortening of expected durations and attention spans. However, we agree with other studies that report positive emotions from using firewood in domestic settings (Petersen, 2008; Nyrud et al., 2012). It is plausible that the issues of time squeeze only emerge alongside such convenience technologies that break up the sequences and the rhythmicity of everyday life. As wood-based heating is obviously hardly a convenience technology, and as convenience novelties such as wood pellets are absent in our data, the problem of hurriedness is less pronounced in the diary descriptions.

Discussion and conclusions

This study is primarily based on two diary collections of the Finnish Literary Society. This data has some obvious benefits as well as drawbacks. The data is

rich in describing the course of everyday life and the role that wood-based heating plays during winter days. However, as the collection was organized by a national institute that is responsible for archiving folk culture and the call was announced as a continuation of the national epic Kalevala, it is probably biased towards hailing traditions such as the large baking oven. Nevertheless, our interview data supports the findings. The other clear limitation concerns the authenticity of diaries. The organizers accepted diaries within four weeks of the stipulated collection day, and we have little indication whether the diaries were written on that day, in the evening or as more postponed reconstructions.

If and when technical systems are part of a culture or way of life, it makes little sense to ask whether they are convenient. Rather than being convenient, they are taken for granted. This, however, does not mean that they become invisible. Rather, technical systems can be thought of and researched as sites of coordinated efforts and work. In this paper, we have pointed towards different kinds of temporal orders, those of sequence, periodicity, synchronization and tempo. Each of these, we argue, contributes to the fact that people find domestic technologies such as wood-based heating to be both reasonable and meaningful, and even take pride and find virtue in participating in them. A related theme that seems quite obvious in the case of wood-based heating is that it creates rhythms in everyday life that are a source of joy and ease for people in the conditions of an increasingly flexible and interconnected global society. Staying warm is a very concrete accomplishment and a checkpoint that people work towards. Earlier research into housework also suggests that the apparent gender-neutrality of heating work contributes to the reported joys and high levels of satisfaction that are found in these arrangements. Moreover, pride, feelings of efficacy and satisfaction result out of an effective coping with the weather. All of these facets sum up to explain why convenience is not always an overriding orientation for consumers.

Our case study is indicative of a particular locus of temporal order. The temporal structuring that occurs around wood-based heating systems bears a strong mark of its technical arrangements. This aspect of structuring, together with the contingent aspect of changing weather conditions, adds to the previous understanding of the structuring of time. In heating work, it is less a question of orchestrating the inputs of various workflows, negotiating institutionally accepted calendar time, or of active efforts to coordinate social events with other people. Rather, the requirements of the technical systems ingrain and entrain a regular rhythm of work that asserts coordination effects over many other aspects of everyday life.

Finally, whilst it is not a novel low-carbon technology, wood-based heating is relevant to energy policy. As a form of renewable energy, small-scale wood-based heating is increasingly used in many countries. Both the promotion of this technology and the management of related particle emissions require knowledge of the use of these systems. Secondly, in many cases wood-based heating systems and practices form the existing backbone into which new more novel technologies are integrated, in various forms of hybrid systems. Thirdly, heating with wood can be taken as a historically, culturally and socially 'rich' practice – something that

coordinates many other aspects of life and that many people have grown up with. Hence, it might give insights for the domestication and cultural ramp-up of a host of other weather-dependent renewable energy technologies.

Can, or should, other more novel renewable energy technologies aspire and strive for a similar social and cultural embedding than may be observed with solid wood-based heating? We hesitate to make this suggestion. The idea that heating systems might proliferate *because* they are laborious is interesting but also problematic: with its deep cultural roots, wood-based heating might be a special case among renewable energy technologies. Moreover, the long processes of cultural embedding may be beyond the span of promotional activities. Nevertheless, we contend that the analysis of temporal order-making is useful for consumer policy and the active dissemination of new, low-carbon heating technologies. Such analyses need to pay attention to the question of how new systems fit into the existing temporal organization of everyday life, and what kind of demands or work patterns they impose and are dependent upon. Specifically, one might want to notice perhaps what kinds of marks on the calendar do different technical systems entail; what needs are to be anticipated and planned; and what kinds of resources need to be brought together to make the system operate. That the rather demanding practice of using solid wood is on the increase, however, signals that convenience and ease are certainly not the only routes along which distributed renewable energy technologies can proceed.

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Notes

1. The development of tiled ovens adheres to the needs to provide heat beyond the kitchen and separate heat provisioning from cooking (Lindmark and Andersson, 2010; Nowakowski, 2011). However, the baking oven is a mixed technology based on the masonry kitchen block that was first introduced to improve the ergonomics of cooking (see Nowakowski 2011). Technical data for commercially available baking ovens indicates a weight of 3500 kg and a heat dispatch rate according to which the peak appears 6–7 h after lighting the fire and that 50% of heat is delivered in the first 24 h (e.g. http://www.tulikivi.fi/tuotteet/HU3400_13_Hellauuni)
2. A common oil consumption figure is 2000 l of oil. Figures for energy content and conversion are from http://www.finbioenergy.fi/default.asp?SivuID=9205

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Author Biographies

Mikko Jalas is a Researcher at the Aalto University School of Business in the department of Management and International Business. His research interests cover everyday life practices, time and temporality as well as renewable energy technologies.

Jenny Rinkinen is a Doctoral Student at the Aalto University School of Business, department of Management and International Business in Helsinki, Finland. Her PhD dissertation focuses on social practice theory and temporalities of renewable energy technologies.

Paper 3

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Electricity blackouts and hybrid systems of provision: users and the 'reflective practice'

Jenny Rinkinen

Abstract

Background: Interest in the role of the user has provided promising insights when considering the transition towards more decentralised forms of energy provision. There is, however, a shortage of analysis on the reflexivity and learning of 'regular' users and their understandings, competences and meanings attached to energy use practices. This paper analyses discontinuities and disruptions in domestic heating during long blackouts and whether power failures could serve as an entry point to the transition dynamics of the practice.

Methods: The study is based on six in-depth interviews on understandings, meanings, materials and competences attached to power cuts with households living in detached houses having different wood-based hybrid systems of energy provision. The interviews were conducted in a rural Finnish municipality, which faced power cuts lasting from 7 h to 6 days in January 2011.

Results: The reactions of the interviewed households to power cuts indicate that blackouts activate unused skills and resources, propose uncommon meanings for electricity and heat and revive dormant elements of practice. Resilience of practice was achieved by flexibility in terms of convenience. However, power cuts were not found to cause explicit, persistent changes in heating practices.

Conclusions: It is argued that disruptions sensitise consumers to the perception of sovereignty and that resilience building and the capability to adjust bring new perspectives to the discussions of the 'pros' and 'cons' of hybrid systems of heat provision.

Keywords: Power cuts; Resilience; Domestic heating; Decentralised production; Practice theory; Energy consumption; Reflexivity

Background

The pursuit of sustainable forms of energy provision has become more policy relevant as the threats of climate change have become more widely accepted. While the strive for political consensus continues and more investments are being made in renewable energy technologies, efficient means to reach tolerable levels of carbon emissions are still lacking. Decentralised forms of energy provision - small-scale energy production - offer new possibilities to rearrange the system of provision to overcome the challenges of the energy 'trilemma', i.e. the pursuit of sustainability, security and resilience of energy systems [1]. In Finland, the context market of this study, aging energy grids, the increasing load on supply and distribution networks, political claims for energy autonomy and in particular the threats caused by the changing climate and extreme weather have aroused doubts and concrete problems concerning the reliance on electricity production. The size, complexity, pattern and control structure of centralised, large-scale energy supply make it inherently vulnerable to large-scale failures [2-4].

Distributed systems, which are suggested to tackle the issues of centralised production, often require a shift in the role of users from passive receivers to more active users, and the conventional producer-user relationships dominating centralised forms of production are to be reassessed [3]. Furthermore, decentralised provision is seen as promising in tackling the issues of climate change and decoupling from non-renewable sources of energy. In transitions from centralised to decentralised forms of provision, a more thorough understanding of the dynamics of these transitions is important.

Correspondence: jenny.rinkinen@aalto.fi
Department of Management and International Business, Aalto University School of Business, Lapuankatu 2, Helsinki 00100, Finland

To better understand this potential and challenges in the changing dynamics of consumers and producers, recent studies have argued for new ways of thinking about energy consumption as happening *for the sake of practices* [5,6]. Practices, for example those of cooling and heating, are argued to mediate and co-produce the relationships between consumers, producers and the system of provision [6,7]. The type of knowledge needed to understand how everyday life processes might work towards sustainability could be gained by detailed analysis of practices, processes of creativity and understanding of everyday life as a productive place [8]. Such analysis could better take into account questions of why, when and how resources such as energy are consumed and thus lead to a more thorough understanding of the premises for sustainability.

An entry point for this paper is the notion that periods of disruption, failure and crisis have been suggested to bring practice dynamics 'to the front' and therefore offer a research arena where the dynamics of practice are open for scrutiny for the practitioners and for the researcher [9]. Previously, a study on the perceptions of blackouts has shown that blackouts evoke both positive and negative associations and that they have past and future temporal referents [10]. Often, power cuts disrupt the whole systemic chain of mundane actions [4]. Here, I aim to take this notion further and discuss the reflexivity provoked by a power cut in the context of hybrid systems of heat production.

This paper contributes to the discussions on the role of the user in hybrid systems of energy provision by discussing disruptions in domestic heating practices, specifically focusing on the practice of heating in domestic settings in a Finnish rural municipality. The focus is on the practice of wood heating because it is a site of active work where hybrid constellations of electricity and energy are directly used as practice-as-entity and as practice-as-performance [6]. In this way, one may research the life course of practices - how they emerge or fade when elements are linked or broken as well as their intersections and transformation over space and time. The long tradition of using wood fuel as a supporting or complementary energy source of heat provision makes Finland an interesting context to discuss the dynamics between centralised and decentralised forms of energy provision. More specifically, a focus on the hybrid constellations of wood heating is relevant for the following reasons: first, in Finland, such constellations are important examples of hybrid systems, which attract the interest of technology developers and policy actors to meet the future needs for heating and cooling. For example, heat pumps, new wood-fuelled solutions, solar thermal collections and other rarer options, such as wind collectors and PVs, are also often introduced to support the running of heating technology. Thus, understanding the dynamics of wood heating is important for the active dissemination of new, low-carbon heating technologies. Such analyses need to pay attention to the question of how new systems fit into the existing temporal organisation of everyday life and what kind of demands or work patterns they impose and are dependent upon [11].

In this study, I focus on the mundane actions surrounding the practice of heating. By domestic heating practices, I refer to the doings and sayings concerning heat provision for detached houses. Obviously, the practice of heating is carried out and managed at the intersect of multiple overlapping practices, but for conceptual clarity, this analysis is limited to the 'elements' of practice, namely materials, meanings and competence. In analysing these elements, however, it becomes clear that certain practices related to electricity, such as cooking and showering, share elements with other practices. As outlined, households with different wood heating solutions were chosen as the focus of the study because wood heating as a typical solution in the Finnish context can be taken as a significant backbone for new technologies.

Analytically, I explore continuities and ruptures in everyday life practices during multiple-day power outages. I present a qualitative study of domestic space heating practices and their interruption in the context of detached houses. This study asks how households living in detached houses with hybrid systems of heat provision are affected when they are faced with extensive power cuts of up to 5 days, both *in situ* and subsequently. Specifically, this paper addresses the question of what kind of 'reflective space' power supply disruptions offer for energy consumers to renegotiate energy use and supply.

After the motivation for studying disruptions in energy use and an introduction to the practice theoretical approach to energy use, I present the empirical data from interviews concerning blackouts as well as the method of analysis and the context of the study. Following this, the results of the analysis are discussed, leading to conclusions and implications for energy use studies, business and policymaking.

Disruptions in energy use

Disruptions and instabilities in energy supply in the everyday life context are chosen as the focus of interest for two main reasons. Firstly, it is suggested that failures could be seen as justifications for policy intervention [12,13]. Greater acceptance of transition policies could be gained if better integrated with the extensive work on system failures as justification for policy intervention: 'A tighter connection with established innovation policies and their underlying rationales may lend more legitimacy to transition policies and help integrate them into mainstream policy processes' [12]. There are examples where disruptions as such have been used as a platform for intervention. In Juneau, Alaska, an electricity supply disruption led to a persistent reduction - 8% of historic consumption - in energy demand

through a combination of new habits and technical improvements [14]. Indeed, the vulnerability of energy systems is multi-dimensional, not only including technical failure, accidents and errors, but also resource availabilities, constraints, diversity of the energy supply and political disruptions. It is an unintended side effect of centralised energy technologies [2]. Liberation from the constraints of current practices is seen as a key driver for attaining higher order learning [15], and thus, disruptions are of relevance in discussing the transition from one form of provision to another.

Secondly, disruptions and failures are seen to have a central role in reflection and change. For practice theory, the 'breaking' and 'shifting' of structure must take place in everyday crises affecting routines, in constellations of interpretative interdeterminacy and of the inadequacy of knowledge with which the agent, carrying out a practice, is confronted in the face of a 'situation' [16]. Within the fields of innovation studies and transition literature, the processes of emergence and stabilisation are widely discussed, rather than those of disappearance, partial continuity and resurrection [17]. Whereas incoming and outgoing configurations co-exist, innovation journeys start over and remain dormant over regimes; such dynamics are often neglected in the domains of innovation studies.

In disruptive situations, the role of consumers changes from passive recipients of complex networks and systems (electricity or fuel) to co-managers of their own practices, involving the dynamics of both supply and demand [7,13]. Different social situations such as home buying, moving and aging prompt disruptions and offer 'hotspots' for interventions. Of course, it is worth noting that such disruptions differ in nature and that the variety of disruptions is extensive. Whereas aging comes as it comes, inevitably, the decision on buying a house often takes place more systematically - and a power cut may come all of a sudden.

Rather few of the contributors to the field have actually attempted to bring these ideas on disruptions into empirical considerations. Despite the growing interest in the routinised aspects of everyday life, there has still been relatively little research into how socially accepted normality and convenience are achieved and constructed. In particular, there does not seem to be enough understanding of how these dimensions of practice are disrupted and how the resilience of practice should be analytically approached. Thus, disruptions raise questions about 'normality' and provide a useful perspective to examine connections between practices, politics and socio-technical systems. Before presenting my empirical data and methods, I briefly discuss the practice theoretical framework directing the research design.

Practice theoretical framework: dynamics of heating

Conventionally, energy use behaviour has been discussed with concepts such as attitudes, values and behaviour models. These approaches have been criticised for not providing adequate means for tackling issues of sustainability and how sustainability transitions could be promoted and accelerated. Consequently, theories of social practice have recently attracted considerable interest in studies on energy consumption. In the pursuit of sustainability, the importance of identifying the practices demanding considerable resources and studying the formation of these practices as a basis for policies has been recognised [18,19]. As has been argued, consumers may be motivated to undertake various symbolic actions to demonstrate their 'green' disposition, but most valued practices are performed with little or marginal consideration for the environment [19].

Practice theory brings added value to the understanding of energy consumption habits, as it emphasises the embeddedness of energy in everyday habits. Whereas the home as a site of diverse heating practices is increasingly policy relevant and studies of adoption and domestication of novelties are increasing in number, few empirical accounts have addressed the everydayness of renewable energy technologies.

The most basic theoretical assumption is that the activities of social life have to be continuously carried out and carried through, and moreover, that this mundane performativity is organised through a multiplicity of collectively shared practices. Activities are unique, but practices are reproduced. Practices are established, delimited, reproduced and organised through social processes of practical coordination [20]. In the practice approach, the individual is seen as a carrier of practices and as a place for the intersection of a plurality of practices [5,6,20,21]. Unlike the more traditional approaches, consumption is seen as occurring for the sake of practices; thus, consumption is not itself a practice but is rather a moment in almost every practice [5].

What, then, constitutes a practice? The dynamics of practices co-evolve between meanings, competences and material, i.e. the elements that constitute a practice [6]. The practice is constituted as these elements are linked, unlinked and delinked over time and as new people are recruited to perform the practice. Meanings refer to symbolic meanings, ideas and aspirations, such as the value of focal points of heat; competence to skill, know-how and technique, such as the ability to manage radiators and other technologies for heat provision; and things refer to objects, technologies, tangible physical entities, and the stuff of which objects are made.

From a practice theoretical perspective, disruptions - temporary breakdowns in the flow of events - are important in understanding the norms, practices and technologies that construct the socially accepted definition of normality [5,6,9]: disruptions open up what is actually perceived as normal. It has been argued that when we encounter some form of significant breakdown, we start to focus on the practice as something separate and discrete: we single people and tools out from their relation with the whole and

thus change over to the epistemological subject-object relation [22].

Searching for temporary breakdowns can thus be seen as accessing - or *reflecting* on - the internal workings of the practice. At any given point in time, a practice has a set of established understandings, procedures and objectives that govern conduct within that practice, often without much reflection or conscious awareness. It has been argued that reflection and change go somewhat hand in hand [23]. Particularly in a period of disruption, it is necessary to reconsider the conditions of one's actions and possibly the historical, material and social making of one's taken-for-granted routines. Consequently, routines, practices and networks of practices are seen to provide a concrete way of tracing the social associations through which situated learning occurs [24]. Reflexivity is beyond the cognitive reflexivity on an event to solve a problem: it is a dialogical and relational activity that unsettles practices and can lead to learning through experience [23], and hence, reflexivity is closely linked to the provision of platforms for interaction. Some even argue that where knowledge is tacit and distributed in different locations, only physical co-location and/or activities and artefacts that encourage social associations are likely to provide access to deeply embedded taken-for-granted practices [25].

Methods

This study is based on interviews with households, business actors (utility service, retailer, maintenance firm) and policy actors. The interviewees were recruited from a Finnish municipality that faced extensive power cuts of up to 7 days in January 2011, followed by power cuts in the summer of 2011 and at the start of 2012. The power cuts of January 2011 were caused by heavy snow falling on trees, and the snow banks and cold weather made repair work difficult to carry out. The power cut was reported as somewhat historical because of its extent, duration and the unusual weather conditions with temperatures down to −25°C.

Altogether, 14 interviews were conducted: six in-depth interviews with households living in detached houses and eight thematic interviews with local business and governmental actors. These interviews were mostly face-to-face (in nine cases, with five phone interviews), semi-structured, and lasted from 10 min to 1.5 h. The interviews were conducted in autumn 2011 and 2012 in a rural Finnish municipality. The emphasis of the analysis is on the interviews with households, while the other interviews are used to reflect upon the broader perception of practice.

All the interviewed households were users of centralised electricity production. They were customers of the local electricity provider by law but could choose the electricity utility with whom to make the electricity contract. Regarding heating, the households had not installed air heat pumps, wind power or solar systems. However, their heating systems could be described as hybrid due to the variety of wood-burning stoves and woodchip boilers (Table 1).

In addition to households, a local home service worker, a representative of the congregation, a maintenance firm, a local retailer, the chairwoman of the local council and two representatives of the utility service company active in the area were interviewed.

The interviewed people were asked to provide a detailed description of their heating practices [26]. Acknowledging that the significance of the experimental performance prompted by disruptions can only be understood in the context of stabilised practices and social relations [27], questions concerning both the 'normal' situation and the disrupted situation were included in the interviews. In carrying out the interviews, careful attention was paid to what kinds of understandings, meanings, materials and competences were attached to power cuts, how these were reflected in the normal state of the practice and how its elements and dynamics were associated. If possible, during *in situ* interviews, the interviewees were asked to 'show us around' to gain a better understanding of their material environment and how they talked about it. Discussions with practitioners provide a sense of how competences have been defined and developed and how individual careers unfold. The interviews were transcribed and thematically coded using Atlas.ti.

Context: heating arrangements in a rural community

The municipality where the interviews were conducted is located in the south-eastern part of Finland in an area with a large number of water bodies. There are 6,400 inhabitants living permanently in the area, and up to 40% of the utility service customers are effectively summer residents. The population is widely scattered.

In the context of this study, solid wood is the traditional means of heating buildings during the cold periods of the year as well as for cooking and preparing meals. The use of wood actually increased by 20% between 1994 and 2008 and accounts for 40% of the energy content of fuels and electricity used in detached houses in Finland [28]. Significantly, however, at the national level, heating systems are changing away from wood use: whereas 30 years ago, 40% of all Finnish houses (including blocks of flats) were only heated by wood, the respective figure is now only about 10%. In more than 25% of the 1.1 million Finnish detached houses, solid wood is used as the main source of heat. Since the 1980s, every newly built house has been required to be equipped with a wood stove (typically a fireplace). There are houses built without a fireplace, but these date from the 1970s and form only a minor part of the housing stock. Nowadays, district heating is the most common heating system in Finland, efficiently providing heat in densely populated areas.

Table 1 Characteristics of the interviewed households

Household	Interviewees	Age group (years)	Other resident(s)	House type	Type of heating system
1	Couple	55-65	Older son (occasionally)	Detached house	Direct electricity and retaining oven
2	Woman	50	Sister and mother	Aged wooden house	Direct electricity and three tiled stoves
3	Man	40	-	One-storied detached house	Wood chip boiler
4	Couple	50-60	Two sons	Aged wooden house	Log wood boiler and retaining oven
5	Woman	40	Man (both only occasionally)	Detached house	Oil boiler and retaining oven
6	Man	50	Woman and two children	Detached house	Direct electricity with retaining floor (heated during the night)

Households living in detached houses as the focus of the study are particularly interesting for many reasons: in contrast to a traditional apartment building, dwellers have or have had the ability to choose the heating system and are also more autonomous regarding, for example, the temperature in the house. The energy costs are often higher compared to smaller apartments, and thus, from the perspective of rational choice theory, there should be an incentive to reduce the energy costs.

Results and discussion

Normality in heating practices and orientations to disruptions

In the following, I present two brief narratives of households with a focus on the heating arrangements before, during and after the power cut. These aim to illustrate the arrangements and configurations of the heating practice. In the narratives also, I point out rearrangements in the energy use practice prompted by the power cut. The following examples can be seen as representative of the sample as they illustrate the two main orientations to disruptions: first, an orientation to embrace disruptions by showing flexibility in heating and everyday life practices, and second, an orientation to seek continuation of the normal situation. After these narratives, more detailed results on the materials, competences and meanings attached to the power cut are presented.

Embracing disruptions

Family 1 is a retired couple living in a detached house outside the town centre, sharing the house with their eldest son. The house was originally built as a summer cottage, but in 1985, it was rebuilt and extended to suit the family with two children. The house is heated with radiators using direct electricity, and in the winter, heating of the internal space is supported with a heat-storing baking oven. The baking oven and wood-burning sauna require 12 to 15 $m^3$of wood yearly, and the house and garage (with underfloor heating) require 16,000 to 18,000 kW of electricity (previously 25,000 kW when fishing equipment was dried on the garage floor). The family obtains firewood from its own forest near the house, aiming at wood storage from 2 to 5 years. The installation of an air heat pump has been discussed but delayed because of the fear of electricity costs (of using the pump to cool the house in the summer time), uncertainty over whether it would 'fit the house' and disagreement over the aesthetics of the device. The father further explained his anxiety over the air heat pump as follows:

> *Uhh, well these heating systems come and go, so at least I have a steady view that if you come up with a system in one house, then at least I myself would stick to it, so no changing because it requires. … Some manager [in a local energy company] reckoned that electricity is good, but once pellets were so cheap that he went and bought a boiler for pellets and all the equipment, and now pellets are so expensive, much more expensive than electricity… and the more technical these things get, the more they need maintenance… and the possibility of a breakdown is higher, that… so many things… well you live according to your situation.* (Interview, household 1)

The power cut in January 2011 lasted 3 days for this family. The family coped through the power cut by intense heating of the baking oven and using water from the nearby lake (which can exceptionally also be used as a drinking water supply). In 1985, when the family moved to the house, they faced a power cut of 2 days. Then, an engine-generator was bought but later sold because it was unused for more than 10 years. The perception of the power cut had changed compared to the one in 1985 as there was considered to be no need to buy an engine-generator:

> *So now when it's [power] off for a day, two or three, that makes no difference; on the contrary, it stirs a certain kind of activity and… R2: Though evenings are bit boring, long when you can't do a thing. Actually, I knitted socks under a headlamp!* (Interview, household 1)

Seeking continuation

Family 2 lives in an old farmhouse outside the town centre. The house is occupied by Mari, who is active in local politics, her mother and sister. The house was renovated in the

1970s, when it was extended and equipped with electricity, but no major changes have been made since then. Now Mari thinks that the house needs a long-term renovation plan to suit her needs and those of her partner's once they live there by themselves at some point in the near future. As with family 1, this house is also heated with electricity and wood (a baking oven and two tiled stoves). In the winter, the wood stoves are used on a daily basis. Mari is responsible for bringing the firewood inside, while her mother assists her with lighting the fires. The firewood is obtained from their own forest with the help of Mari's partner.

Mari and her family faced a power cut of 4 days. Unlike the other interviewed families, Mari reported feeling insecure and intimidated when the power was off. She was surprised that the phone stopped working, which further increased her anxiety:

> *So it was a scary feeling, and it was the feeling that you have to manage on your own. It struck me that we are here now on our own, that what will happen. Certainly we have neighbours within half a kilometre, but you can't see them from the garden. So it was a comforting thought that the neighbours were in the same situation as we were. ... And then we really started to think that, sure, we had anticipated that it's the weather, that this looks bad. That we had run cold drinking water in advance.* (Interview, household 2)

Mari had reserved some drinking water and few pails of water to flush down the toilet. She used wood for space heating and left the indoor doors open to allow the heat to reach all the rooms. When the power cut had lasted for 1 day, her partner managed to purchase an engine-generator, which he installed and gave Mari advice on how to use it. Mari describes this as a saviour:

> *The engine-generator had the capacity for water pumps, ground floor heating, lightning, and with small arrangements we could also use the stove. That's what saved us.* (Interview, household 2)

Dormant materials and rearrangements

In the face of disruption, households reassessed the materiality related to heat provision and electricity use. The central boilers stopped working, radiators turned cold, the house became colder, lights did not turn on, cell phones became silent and electrical cooking appliances did not work. Consequently, in most cases, a variety of dormant materials held in reserve were brought into use, something that was oftentimes reported as business as usual in comparison with the alleged situation:

> *I just want to say that in Ilta-Sanomat [tabloid newspaper] there was a headline that 'Mäntyharju is in panic'. I would say that the reporter was in panic, but no one here panicked. In the countryside, we know how to... differently you know, because with old houses and everything, everything has a certain backup system.* (Interview, household 4)

These backup systems included engine-generators, wood stoves, gas boilers, garden wells, blankets and alternative forms of lighting that were used to maintain the normality of activities. One interviewee tells about a fire-burning stove that had been left unused for years:

> *The fireplace has been there, I don't even remember when we have had a fire in it. Not in 20, 15 years.* (Interview, household 3)

In most cases, these backup technologies were found inside the home, and some were bought from the local stores or provided by friends or relatives. For those people who had an urgent need to access electricity, the acquisition of a new backup device (engine-generator) became a sensible option. Some households with livestock already had an engine-generator ready to be used. Generators were also circulated within the community, amongst neighbours. Thus, many of the interviewees possessed homes having dormant elements of decentralised, hybrid energy provision. In terms of the materials of the heating practice, the purposes of certain technologies were rediscovered, as in the following case where a respondent describes how they started to heat the sauna to keep the water pipes running:

> *When you heat up the sauna - all the water systems are there - they remain unfrozen.* (Interview, household 1)

In household 6, where the power cut lasted only 7 h, the attention was directed towards other vulnerable spaces and locations - the summer cottage and relatives living in the countryside:

> *Well, we of course followed the situation, because we have a cabin in the countryside. Nothing helps there if it gets below zero; the water pipes just freeze. Luckily, this didn't happen because we went there so often, but at one point it was minus four. My parents live there in the countryside, and it calls for a certain creativity. I don't really remember how long the cut was, but days, as it was in the worst area. They have an engine-generator, but it's so small that they only use it for wood heating, as they have the water pipes, so they get the hot water running there and then turn it off.* (Interview, household 6)

Control and competence

In general, heating was relatively visible and present in the everyday life of the interviewees due to intense wood heating during the colder periods. However, the disruption invoked a set of physical, social and mental skills required during the power cut. Disruption acted as means to get to know how the house works and thus affected the competence of the dwellers. The disrupted practice required increased manual control of heat provision that was more time-consuming, but resourceful solutions were sometimes found:

> *So there where the weak part was, we started to heat it up with the generator. It's like... it's there in the yard and the lines come in, you have to have extension cables. Our Olli [son] said when I asked 'how can we make this blow' - he just replied 'let it stay there for the night; when the fuel runs out, then it will stop, you don't have to keep track of whether it's turned off or not.'* (Interview, household 3)

During the power cut, the media reported on older people who lived in unsafe conditions with very low indoor temperatures and with weak physical skills - but who refused to leave their homes, often because of pride and the willingness to tolerate lower comfort levels. However, the ones who left the house during the power cut were often older people with no physical strength to adjust to the lower temperatures, to prepare food without electricity, to manage in the darkness or to heat the house with wood. This shows the competence needed:

> *Older people living in the midst of power cuts have taken the situation positively. A taxi driver who drove around old people's homes yesterday evening tells that most of them are fine. ... Yesterday none of the elderly were willing to evacuate, but the colleagues [of the taxi driver] had faced a different situation: they had evacuated a few people to the health center for heat and care.* (MTV3 news, 26 January 2011)

In household 1, the activity and resourcefulness of the husband's mother was reported as an illustration of the 'right' attitude:

> *Well, I don't know, it's a question of attitude. So if I tell you a true story, my mom lives there [in Kousanniemi] and we've had electricity since '82 in that home place. And I went to clear some snow from the roof and check because I knew that the power was off. My mom said that there's no water, but there is heat. And I thought I would go and get some water from my brother because he lives nearby, so I would get water from the well with a hand pump. It was only few minutes, I was just on the roof and mom appears and calls me for a coffee. I was, like, where did you get heat and warmth? 'Well, I lit the stove and melted some snow for water for you...' So to her it was just a natural thing that there's fire in the stove, fire in the oven, fire in the tiled stove, logs from the shed, water from the well. So that's how you live.* (Interview, household 1)

Accordingly, the households reported that elderly people proved more competent than publicly assumed. Competence was also shown through the ability to adjust indoor habits. Adjustment or loss of control meant, for example, allowing the lowering of the room temperature from normal comfort levels:

> *I feel that people didn't really consider that if they don't have electricity they can use candlelight. At some point I felt that our measures are a bit excessive. Old people there in the village have learned how to cope before.* (Interview, congregation employee)

When comfort at home was not enough, seeking comfort outside one's own property was an option for some. Respondents reported neighbours, relatives and acquaintances who had left their homes because of the blackout.

Circulated meanings

Some households reported a culture of energy conservation before the disruption by emphasising the low use of electricity around the house. These people also valued self-sufficiency in their heating and reported achieving it using wood as a source of heat. Interestingly, the power failure was consistent with their normal orientation as they reported business-as-usual feelings.

Coping in the face of the power cut evoked many meanings attached to the power cut. Whereas the electricity utilities typically strive for universal, homogenised service provision, the households embraced heterogeneity in their provision solutions and their sense of sovereignty. Feelings of insecurity, unpredictability and non-autonomy were taken as given:

> *People just say that you have to be on your own. Once we've learned that the welfare society works so this is one reminder that it doesn't. So that provision, self-sufficiency - wait a minute how do you say it... you have to prepare yourself for exceptions.* (Interview, household 2)

> *Our principle is such that the more self-sufficient you are, the better all round.* (Interview, household 3)
> *Maybe in this state of emergency you get a foretaste of what could happen, and then you realize how dependent you are, there's nothing you can do; basically, everything stagnates for a while in personal life or in working life.* (Interview, local entrepreneur)

Coping was especially highlighted in the stories concerning older people. Coping with the power cut also meant renegotiating the concepts of privacy. Interviewees reported sleeping in the same room, sleeping with the door open and showering in more inconvenient places (such as in the barn):

> *But I feel that old people here cope pretty well because they have the stove and oven and they get water as well... It's that when you have lived your whole life in the countryside, and they say that we didn't have this before, but you do remember how we have coped before and we can live like this for a while. That it doesn't do much to our lives.* (Interview, household 3)

Reflective practice

In the reactions of the households to power cuts, we can identify a resumption/revival of 'old', dormant habits. Dormancy here refers to materials, meanings and skills that had once been active but that had been unused due to new arrangements. Thus, rather than seeking change in the future, past arrangements were given value and put into effect. Past arrangements were not, however, romanticised, but they were valued for their flexibility, frugality and familiarity[a]. Furthermore, low-tech arrangements (e.g. opening doors to allow heat to move around the house) that do not require new technologies provided simple, at-hand solutions to endure the power cut.

The (dormant) practices can only be reactivated if there are flexible or hybrid material structures. Reflectivity was prompted through the carrying out of practice, i.e. 'work' and 'non-work'. Thus, the respondents did not report conscious reflection on whether they should change the material arrangements of their practice, but rather the elements of the practice started to be renegotiated, i.e. notions of autonomy, security and reliance were brought into the open. Furthermore, reflexivity was prompted both towards the home and outside it. In other words, acts of repair were expected from both decentralised and centralised systems of provision. Consequently, the web of practitioners (neighbours, community, energy companies) became more visible. One aspect of the cultural rooting of heating systems is that they enable and/or imply social relations.

In general, heating was relatively 'visible' and present due to intense wood heating during colder periods. This orientation towards wood heating requires planning and labour as well as a harvest-when-available and store-until-required mentality. In terms of convenience, the households found the development of hybrid systems important. In times of normal conditions, cheap electric heaters are often used as backup systems to enable flexibility. Some use fireplaces to provide extra heat and comfort during cold spells. In most cases, wood stoves, pellet heating systems and other small-scale production co-exist with electric heating. However, this is not to say that both of these technologies are integrated to work in tandem. Rather, when one fails and indoor temperatures begin to drop, the other is manually operated to provide the backup. Electricity as a backup also offers possibilities for extended absence. Some residents have organised their lives so that this type of backup is hardly needed and, for example, minimise travel during the heating season. For those who are engaged in livestock rearing, this 'choice' is part of their occupation, but for others, detached houses and solid wood-based heating systems belong to the non-occupational bundle of practices connected with reduced mobility. However, most users of solid wood heating systems make use of the flexibility offered by hybrid systems, and in our diary data, we encountered many respondents who are less committed to wood as a heat source but rather appreciate it as an aesthetical joy that is available when desired. When solid wood is part of such a weak or less coercive arrangement, it fits more easily with the mobile patterns of contemporary life.

Conclusions

Energy is most closely intertwined to the everyday practices it sustains. In this paper, I have discussed the flexibility of energy consumption practices, focusing on the dynamic and 'hard-to-catch' energy use practices and on understanding the processes through which forms of energy consumption change and are reproduced. Through a case of indoor heating practice and its disruption during a multiple-day power cut, I have demonstrated how the practice of heating carries dormant elements of practice that are reactivated and enacted during an instable event. As evident based on the analysis, no single solution was found for the interviewed dwellers to cope with the power cut; rather, coping was maintained through a mixture of different arrangements, adjustments and compliances. A broad set of socio-technical practices were evoked in conversations as circulating across boundaries to categorise performance.

This exploration of user practices during long power cuts has revealed that power cuts serve as spaces for reflexivity on the heating practice. This reflectivity was bodily and material, but little explicit reflection on persistent changes was observed. Little evidence was found that the disturbance in the power supply brought about reflection on energy use on a more general level. However, blackouts activate unused skills, resources and technologies that have been replaced/superseded by other elements but have remained dormant for one reason or another.

A distinctive feature in the research design was that heating was provided through embedded and localised systems of provision. These systems supply more resilient energy services than non-autonomous systems [19]. This opens up further discussions on resilience as an

argument for supporting the development of small-scale renewable energy production and, for instance, community-led energy initiatives. It is worth noting that in the case of wood-based heating, the technology is highly visible and laborious [11,29]. This implies that households have gone through negotiations concerning the practical efforts required to reach and maintain acceptable indoor temperatures. Given this, an existing know-how on the limits and possibilities of the practice and its linkages to other practices might make the adjustment to external disruptions easier and more tolerable.

Focusing on households with wood heating solutions as a backup technology can be considered somewhat excluding and a limitation of the study. Importantly, however, this study implies that the rather demanding practice of using solid wood in heating signals that convenience and ease of use are certainly not the only routes or slogans along which distributed renewable energy technologies can progress. Consequently, research and policymaking should acknowledge more openly that sustainable solutions are not only derived from above and from outside the context of users, but can also arise from the local context and from users' everyday experience.

In terms of disruptions, practice theory allows us to research the situated processes of gathering the knowledge required to accomplish practices. Through practice framing, this implies a shift from only questioning which skills and knowledge we need to examining how they are taught, how they are learned, how they travel between moments of performance and how they change and are made anew [6].

The interview study that I have presented in this paper provides an account of the domestic heating practices in the normal state and in a state of disruption. However, further mixed methods could be used for a more in-depth understanding of the life trajectory of the practice and the practice bundles that are linked to the use of hybrid forms of energy provision. The interviews were conducted only once, and people could find it difficult to reflect on their practice with a 'stranger'. Thus, a study with a longer time scale or successive in-depth interviews could be considered. Consequently, interviews during power cuts would be interesting in terms of capturing the disruption as it occurs. In addition, the interviews could be extended to cover other local actors and, for instance, the energy company. This would allow us to analyse the dynamics between the 'practitioners', understanding them in a broader sense. As practice approaches attract more interest in sustainability and energy studies, the question of how practices are learned and developed warrants further theoretical and empirical elaboration.

Endnotes

[a]It should be noted that the interviews were not conducted with young family members.

Competing interests

The author declares that she has no competing interests.

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Paper 4

Rinkinen, J. & Jalas, M. Dynamics of heat: Houses, new dwellers and the formation of heating practices.

Unpublished essay. Currently under review.

Dynamics of heat: Houses, new dwellers and the formation heating practices

Jenny Rinkinen
Aalto University School of Business, Department of Management Studies

Mikko Jalas
Aalto University School of Arts, Design and Architecture, Department of Design

Abstract
This paper examines the formation of heating practices in the moment of moving houses. Interviews on occupant changes in single-family houses with a focus on heating arrangements and thermal comfort reveal that the process of practice formation in and around occupant changes is a complex circuit of aligning elements where the house stands out as a coordinative and coordinated aggregate. As houses pass from one set of occupants to the next, they prove themselves as one of the nexuses through which practices exist or are put into effect. The study demonstrates hidden complexity to what seems like a straightforward process of residents interacting with a new heating system and home. The findings contribute to the understanding of the domestic sphere as a space for practice formation.

Keywords: Domestic space heating, materiality, occupant change, social practice, thermal comfort

Introduction

Social practices have been increasingly recognized as a focal element of inquiry in studies on energy demand and housing. It has been proposed that better understanding on how energy-intensive practices such as heating are organized within the domestic sphere can support the policy measures of steering resource use and climate change (e.g. Gram-Hanssen, 2010; Strengers, 2013; Shove and Walker, 2014). Not only do these studies draw attention to the organization of energy use and technologies within homes (Gram-Hanssen, 2014), but they also engage in the broader social dynamics of changing demand for energy (Shove and Walker, 2014).

For housing research, social practice approach offers new concepts for thinking about the relationship between dwellers, houses and energy demand. Houses as homes can be thought of as material, which mediates and distributes practices of dwelling, but also acts as a nexus for various other social practices and flows of services (Hand et al., 2007). Despite their localized characteristics, houses are collective through the intensive public regulation related to houses and housing. For example, the retrofitting of existing buildings leading to the adoption of more energy efficient practices is widely seen as major policy concern and opportunity (Rydin and Turcu, 2013; Gram-Hanssen, 2014; Bartiaux et al., 2014). More broadly, safety, health, and energy consumption are public interests and leverage points of policy-making, which prescribe particular actions within homes.

If and when houses prefigure practices and stand as a nexus for social life, occupant changes are a key event. Thinking in practice theoretical terms, at the moment of moving houses, the fitting and linking of the materials, meanings, and competence of practices takes place (Shove et al., 2012). When seeking houses, new occupants need to take into consideration the previous dwellers, their practices, and the characteristics of the house. Occupant changes are also key events in the working of policy. Houses, when sold or rented, are momentarily in the spotlight, as both their value and their ability to fulfill policy objectives, such as energy efficiency, are re-assessed.

Previous studies have discussed ownership changes of private houses as events providing a particular policy opportunity for improving the energy efficiency of the housing stock (Schäfer et al., 2012; Gnoth, 2013). In practice theory, there is an ongoing discussion concerning whether disruptive events allow for and promote changes in practices (e.g. Trenttman, 2009; Rinkinen, 2013; Maller and Strengers, 2014).

Against this, and the call for better understanding houses as distinct material elements of practice (Ellsworth-Krebbs et al., 2015), this paper presents an empirical study on moving homes as an event for the formation of heating practices. Practice formation does not refer to the emergence of novel practices, but rather to how practices are reproduced in the 'disruptive' event of moving homes. The focus is limited to on-site space heating, which is conceived as a recognizable entity of material arrangements and heat flows, and often resists change due to either vested investments or limited possibilities for retrofitting

(Gram-Hanssen, 2014). This research suggests that houses form compositions through which different services and resources flow. Such material arrangement requires, or matches with, particular competences and meanings, as well as spatial requirements and temporal patterns (cf. Shove et al., 2012). The study demonstrates hidden complexity to what seems like a straightforward process of residents interacting with a new heating system and home.

Houses as prefiguring composites

Social practice is a recognizable entity with a teleological structure (goal and aim) consisting of elements that are linked over time and space and carried by more or less devoted practitioners (Schatzki, 2002). Elements, of which practices are made, can be compressed into competences, meanings, and materials (Shove et al., 2012). The ways practices spread and recruit new practitioners depend on the circulation of the elements and the linkages that are made and unmade between the elements of practice (Shove et al., 2012).

Understanding of the home and house in social scientific energy research has not been subject to detailed discussion until very recently (Ellsworth-Krebs et al., 2015). Whereas certain spaces, such as the kitchen, bathroom or space-extensions through retrofits have received attention, the broader understandings of house and home as an element of practice has been less touched upon. Recently, however, Ellsworth-Krebbs and colleagues (2015) have pointed out to the pairing of energy-intensive social practices such as heating with the concept of the house. 'House', in their view, turns the focus on the technical sphere of energy use, such as efficiency and regulation, whereas heating at 'home' acknowledges greater complexity and stresses the socio-technical aspects of energy use. It follows that stressing the home instead of a house is a way to emphasise the social side of interventions instead of technical sides. 'Home' also allocates the users an active role of the dweller instead of a passive resident, and portrays occupant satisfaction as complex instead of definable (Ellsworth-Krebs et al., 2015). Even though these dimensions are simplifications and there are overlaps in the use of concepts, such a conceptual distinction gives a strong sense of the notions that have been understated in studies on in studies on domestic energy use.

It is clear that the built environment and spatial arrangements have been extensively exploited and explored as a medium to materialize and inscribe ideas and habits, and it has been recognized that residential houses have a significant role as the material interface for a diverse set of social practices (Shove, 2003; Shove et al., 2009; Miller, 2001). Houses and homes have been designed to incorporate developments in modern hygiene (Shove, 2003), the rationalization of domestic work (Cowan, 1983), and low-carbon living (Marres, 2008). Houses in this sense prefigure practices; in other words, houses as present material arrangements make future combinations easier or more difficult to achieve (cf. Schatzki, 2002: 45). According to Miller (2001: 110), when moving into and maintaining a house, one has to constantly contend with the pre-given ordering schemes of the house. Southerton (2001) has documented how occupants come

to express differences in cultural capital in the remaking of kitchen decoration, cooking activities, and the usage of kitchen space.

Thinking more specifically, houses as a category of objects have many peculiarities. While standardization has occurred, it remains that houses result from local production activities. As their basic character, houses are supposed to exhibit openness to different practices within, and thus be adaptable to new technology, ideas, personal tastes, and changes in other practices of everyday life. While their long life span typically means that they need to be open to refurbishment and upgrading, houses end up having various technologies and local installations that bear witness to user preferences and local conditions to a far wider extent than most other products, such as used cars. Again due to their long life span, but also because of property-bound characters and relatively high investment costs, houses are extensively traded in the secondary market. People thus buy more 'old' houses, which may have more idiosyncratic peculiarities than new houses. Considering these points, it is difficult to see a house as a distinctive object, but rather as a rooted, yet dynamic composite. Even though newly built, house is an outcome of complex social interactions. Users and materials of different generations impact on each other, and the process of alignment is likely to extend over time.

How material things come to prefigure social practices is to a degree a question of design. The ideas of designers are conveyed to consumers by embedding them materially in the forms of scripts that guide users into certain forms of engagement while inhibiting others (Akrich, 1992). In Akrich's (1992: 208) words, "designers define actors with specific tastes, competences, motives, aspirations, political prejudices, and the rest, and they assume that morality, technology, science, and economy will evolve in particular ways." The end product of this work by the designer is a 'script'.

However, for many brands of commercial goods, the use of objects is strictly separated from their design. Practice theoretical approaches thus set limits on the determinacy of design, as they highlight the alignment between materials, the symbolic and social aspects of everyday life, and the corporeality of involved humans. Thought of in this way, technologies may not only lead to new arrangements of people and things, but they may additionally generate and 'normalize' new forms of knowledge about the world (Akrich, 1992), and new orders and causalities (Shove and Southerton, 2000; Schatzki, 2002; Hand et al. 2007). Even though technologies may consist of closed scripts that propose certain normative roles for subjects and a stable relation to other artifacts, some technological scripts are more 'open' than others (Shove, 2003), and the ways people appropriate technologies for alternative purposes to those intended by designers vary. This hints that the term 'script' can refer to an unnecessarily static understanding of the relations between materials, users, and practices.

Hence, it is not clear whether the concept of a script fits the house. Lees (2001) criticizes the understanding of a building as a script, since it neglects how ordinary people engage with and inhabit the space. It appears that houses, as composites, are an interesting mixture of weight and agility. It has been proposed that the interaction between buildings and occupants is a sum of

affordances, as offered by houses on the one hand and the intentional and effective occupants on the other (Tweed, 2013; Clapham, 2011). These views, however, underplay the significance of practices that such interaction is prompted for, as well as the becoming nature of things. Conceptually, this resembles the idea of configuration, which suggests that many elements are figured together, and resists connotations of a unified and universal entity such as a system, object, or artifact: devices can consist of "an orchestration of multiple layers of configuration" (Hyysalo, 2010). However, such conceptualization underplays the perspective of flows, according to which "the house is perceived in terms of a connection made to a range of networks that provide the sets of material flows—water, energy, waste-services, information, etc.—which underpin and organize our daily lives" (Mol and Spaargaren, 2006).

Practice theoretical concepts and empirical evidence suggest that houses have momentum in themselves. Even though the home is a restless place, and the practices associated with its technologies can also vary and are subject to change (Hand et al., 2007), houses tend to remain relatively obdurate (Bervoets and Heynen, 2013). In the frame of this paper, technologies and their constellations are understood as prefiguring composites, which are in the process of becoming, and are shaped by and shape the practices humans carry out in interaction with, around, and through them.

Conceptualizing heat as service and work

The understanding of the mutual relationships between materials and practices should account for the flows of services and resources it enables. Many have acknowledged heat and thermal comfort as one of the focal services of energy, and requisites for 'proper living'. Heat is indispensable for actionable bodies, and it enables the normal course of everyday activities. However, from a practice perspective, heat is not a unified service (Chappells and Shove, 2005). Whereas the previous literature has built on a rather technical and static idea of thermal comfort, practice studies have started to see thermal comfort as a negotiated, non-standardized achievement (Shove, 2003; Chappels and Shove, 2005; Hitchings and Lee, 2008). In effect, the practice of heating is characterized by a fair amount of relational dynamics, as it is considered as temporal (Jalas and Rinkinen, 2013), sensory (Royston, 2014), bodily (Vannini and Taggart, 2014), participatory (Juntunen, 2014), and regulatory (Strengers, 2013) in nature.

Negotiations and relations around heating not only address what comfort level is tolerable or desirable, but also the needed and accepted practical efforts. While such negotiations may be settled over time, they re-emerge in ownership and occupant changes, as concerns over the mutual compatibility of houses and their occupants are heightened in the phase of settling into a house (Miller, 2001). Some links may endure, and some practices may also prove feasible for new occupants, while other arrangements take a new form. Overall, the properties of houses and their importance as the materialization of ideas and ideals indicate that the alignment between new occupants and existing houses requires deliberate efforts and work.

Research approach and methods

The dynamics of occupant changes were explored by conducting interviews with households who have recently moved house. The focus of the interviews was on the understanding of the alignment processes of the mover and the house in the formation of heating practices. Dwellers and occupants refer to practitioners, i.e. individuals who are carriers of multiple practices in the domain of the house as home (see Shove et al., 2012).

Our primary material consists of in-depth interviews and house tours carried out in 2013 with ten families who had moved into a detached house within five years of the interview (see Table 1). The interviews were complemented with photographs taken during the house tours, as well as available documents on energy use, such as the 'house folder', energy certificate, energy use data, and energy bills. The interviewees or we initiated also some follow-up emails. While the interviews were informative in terms of the activities and episodes that were going on in the house in terms of heating, the complementary data were used to supplement our understanding of the material interface and arrangements within the house. Extracts of interviews were translated from Finnish into English by the authors when needed – however, one of the interviews was in English.

The interviewees were families living in the southern parts of Finland, recruited by word of mouth. In selecting the interviewees, the following selection criteria was set: families living in detached or semi-detached houses, excluding recreational residences; both old and newly built houses, but rejecting the ones built by the occupants, because in these cases the heating system is selected by the builders; and houses from low value to an average price, apart from high-end houses due to the relative indifference towards heating costs. The cases were selected to include a variety of heating technologies ranging from wood heating to central, electric and district heating, and a variety of heat pumps (see Table 1 for a summary). Five of the cases were households that had renovated the heating system since the purchase or were in the process of doing so, and four of them had carried out no renovations. Most of the interviewees had moved from an apartment to a house and from one kind of heating system to another; in other words, the new home was different from the previous one.

Moving homes in practice

The following analysis focuses first, on the interface when potential occupants anticipate the heating practice. The early phase practice formation, in which new occupants familiarized themselves with the heating conditions and in some cases made renovation to accomplish an acceptable form of heating practice, is recognized. Second, the further process of practice formation shows how the house teaches the dweller, what tensions and challenges there were between the dwellers and technology, how dwellers align with the material arrangements of heating, and what actions this alignment requires.

Two cases are used to illustrate how homeowners interact with a new heating system and home. The first case demonstrates how practices of wood heating

were formed in the process of occupying a 70-year-old house. This case is informative in revealing the longitudinal and flexible nature of practice formation. The second case shows how new dwellers occupy a passive house. It does not only describe poorly performing technology, but shows how heating becomes unintentionally 'explicit' and problematized issue.

Case 1: Wood heating as a practice in becoming

One of our interviewed families (Interview F) had been looking for a house to enable a more 'natural' way of living as compared to life in an urban environment. This couple with two young children had previous experience of living in a detached house in non-urban areas, and valued it as a form of living. The couple found a suitable house in the area they were interested in. However, the house required a major renovation, which caused some uncertainty, and before the purchasing decision, they spent a large amount of time getting to know the house through various documents, and with the help of villagers and other peers. Finally, the family chose to buy the house and begin with the renovations.

The house was built in the 1940s and the last renovations had been carried out in the 1970s and 1980s. The family decided to carry out a comprehensive renovation in which they aimed to "respect the history of the old house". During the planning and renovation, and when finally occupying the house, a lot of time was spent thinking about how the house "operates naturally", the character of the house and what kind of heating arrangements would be most appropriate for it:

> I have always wanted to make it clear to myself, and maybe to [his wife], as well, that you have to move into an old house with its conditions, not with your own conditions and start to insulate and ruin it, make it unbreathable and all that. There are certain things in an old house that just are like that. And if you don't approve of them, then you shouldn't move into an old house. You can have a temperature of 25 degrees here with electric radiators if you are willing to pay electricity bills of 200, 300 euros a month. (Interview, Family F)

When renovating, the couple got rid of the heating arrangements that had been installed for the previous dwellers. After rejecting ground source heating as too expensive, wood-based heating solutions were their choice. They considered it as a heating form with low emissions when carried out skillfully. Wood heating was also considered lucrative from the point of view of aesthetic appraisals. Wood heating was initially part of the character of the house, and as a heating form it posed meanings attached to an ideal way of living. The family reported that wood heating feels cozy, it is not sterile, and it gives a hands-on experience with the materials of heat.

Table 1. Summary of interviews

	Dwellers and type of house	**Heating system**	**Summary of alignment dynamics**
A	Couple with two children. Wooden house built in 1930 for two families	Central heating with pellets. Moving in without renovating	Dwellers had previous experience of detached houses but the pellet system was still surprisingly difficult to use. Difficulties in operating the labor-demanding pellet system in terms of time and skills. Lots of learning required. The system is planned for bigger capacity than what the family needs.
B	Couple with one child. New passive house built in 2010	Passive house with solar collectors, supply air heating, fireplace	Problems with the faulty heating system as indicated by the high energy bill and difficulties of setting the preferred indoor temperature. Lots of solving and learning required (where's the fault, how to adjust the system, who to ask for help).
C	Couple with two children. Wooden house from the 1950s	District heating and atmospheric fireplace	Dwellers were familiar with district heating. Maintenance work happens in the operating room. Indoor temperature is not fully comfortable but finding the optimal adjustments would take time. Relative lives in the brick-built extension part from 1969
D	Couple with two children. One-storey house built in 2000	Underfloor electricity heating and a fireplace	Moving into an aesthetically attractive house. The discreet underfloor electric heating was appreciated. The use of fireplace as supporting means of heat followed the rhythms of they year and the social rhythms of the family.
E	Older couple 1970	Oil heating	A couple approaching retirement moving to an ample house. Renovations were planned but the oil boiler was in good condition so it wasn't feasible to make changes.Long acquisition period. Mixed up adjustments after the previous owners, it took a while and some effort to solve them as the underfloor heating reacts so slowly. The technical survey had a key role in limiting and scaling down the renovation intentions.
F	Couple with two children. Wooden house built in 1940 for two families	Wood heating with several stoves	Extensive renovation. Lots of thinking on how the house would 'operate naturally', i.e. what's best for the house. Some new stoves were installed. Adaptation to and enjoyment of a strongly ordering way of heating. The couple stressed the importance of 'natural' living and, for them, an old house with wood heating enables that. Heating arrangements require flexible work, attendance and good physical condition.

G	Couple with two children. House built in 2000	Exhaust air heat pump and a fire place	Small renovations for insulation and uncertainty in operating the exhaust heat pump, i.e. how it should be adjusted. Seeking assistance from peers and specialists Regular maintenance needed. Wood heating follows the rhythms of the family and outdoor temperature.
H	Couple with one child. House built in 1940	Ground source heat, pönttöuuni, wood stove	An old house and a renovation project that has grown and extended far beyond the original plans. The architect and city administrators have played a key role.
I	Couple with three children. Wooden house built in 1920/1930, renovated and extended since 2010	Direct electricity and wood stove	A young couple with children moving to a rural house that belonged to the grandparents of the husband. The condition of the building was worse than expected. Living in the house while renovating it. Plans to complement heating with an air heat pump and a fireplace.
J	Couple with two children. Wooden house built in the 1940s	Boiler for oil and wood	Searching for an affordable house in an urban environment. Quick purchase and renovation plans for a 1940s house while living in the house. Original priorities have changed because of oil bills. Scheduling according to the tax deduction opportunities.

The family was aware that houses with small-scale wood heating call for a regular, social, bodily, aesthetic, and skillful engagement with energy, nature, and the rhythms of the seasons. Wood heating requires active, temporal work and management of heat flows, and it is spiced up with instances where the sensory aspects of keeping warm are particularly relevant and active. Wood heating denotes an 'open' and visible form of heat provision that allows itself to be managed, adjusted, and moderated, and it frequently delivers patterns of heat provision where the indoor temperature is not fixed but temperature is allowed to fluctuate. This type of provision is isolated and localized, even though regulatory, political, technological, and cultural dynamics extend its realms.

This family did not strive for a unified composition of space heating, but rather heat flowed variably in and across different rooms and times of the day, week, and year. The uneven distribution of heat affected their use of space and thus directed certain practices. For example, the television was placed in a separate room that was often unheated, and thus the watching of TV was allocated to only one day of the week. Moreover, the new technologies that were installed were not 'successful' in delivering unified heat, as shown by an example of a retrofitted pellet stove that 'turns the room into a sauna' and also shifts the heat load to other parts of the house, making some parts unbearably hot for sleeping. A solution to this problem was sought by using a spare fan that was installed close to the ceiling to move the air around more efficiently, thus showing flexibility in terms of aesthetic expectations.

The chosen heating arrangement, with four wood stoves and one pellet stove altogether, requires flexibility in terms of work and attendance, as well as a good physical condition for managing the firewood. In their material character, domestic systems for heating with solid wood imply large volumes of raw materials. Logs – pieces of wood – are chopped, dried, grafted, stored, and finally burnt in fireplaces of different scales and types. In a heating season of 200 days, one thus carries and combusts on average 40 kg of wood every day, and during cold spells this amount doubles. However, this management of material flows has not been a primary objective of housing design, and the carrying of logs needs planning. This also means that wood-based heating requires physical abilities that some, for example elderly people, may lack. To accomplish the task of wood heating, the family reported home-based living patterns, and the help of the neighbors during longer periods of absence was also valued. Nevertheless, at the time of the interview, there were ongoing negotiations within the family on a possible backup solution to ease what at times was relatively heavy work, and in particular there was a discussion on the need to install electric radiators that had already been purchased.

Case 2: Passive house, active dwellers?

We now move to another case – a new urban passive house – to examine a practice formation that did not happen as planned. Rather, the early phases of occupying the house were strongly characterized by malfunctioning heating arrangements, and the challenges of locating the fault and the unclear responsibilities in this task.

A couple with a young child were the new occupants of this 99 m² passive house (Interview B). The house was equipped with solar collectors, supply air heating, a fireplace and efficient R-values, which indicate the level of insulation. Initially, the couple looked for an inexpensive semi-detached house. However, they found this detached house interesting because they saw it as nice, easy to live in, and environmentally sensible. The couple also reasoned that the advertised low energy bill would compensate for the higher price of the house.

This family did not have prior experience of living in a detached house or any substantial knowledge of passive houses. When describing their living preferences, the couple emphasized that they were looking for something convenient and easy. The house was advertised as a passive house, but it was unclear to the family what this meant. During purchasing phase, they received a commercial document on the characteristics of the house design, which stated that the house would go 9 months without heating, and that the costs of heating would be €32 per month.

After gradually moving in during the relatively warm summer months, the high electricity bill came as a surprise. There was no clear and obvious explanation for the high bill. The family was provided with a house portfolio that could yield some clues to why the bill was high, but the couple found themselves reluctant and short of time and energy to go through the documents in detail. Another point of reference was the three houses with a similar design that had earlier been built on the same site. The couple had face-to-face discussions with the neighboring dwellers, but they did not find this very useful, for the problems

they faced appeared to be unique. Even so, as this was the first time that the family had lived in a detached house, they also tried to make comparisons with other residents in the area, but they found their houses and problems incomparable. All in all, the heating solution was technical and complex and it was time-consuming to get to know why things did not work and how they should work.

At first, heating and the proper use of energy in the house were 'explicit' and problematized issues only through the energy bill. This triggered the idea that something was wrong. When the weather became colder, the indoor temperature stayed low despite the attempts to operate it manually. The low temperature was a further sign that things were really not how they should be, but it was still unclear whether this was due to a malfunction of the technology or whether the couple had unrealistic expectations of how the house would function.

The operation of the heating had quite a closed script, and learning to know the script was tricky and problematic:

> I should mention that with the beginning of the heating season we discovered a fault in our heating system. It turns out this fault has had an influence on the energy consumption of the house, because basically one of the heating elements in the house has been continuously blowing hot air (about 50 °C) non-stop, also throughout summer. Anyway, together with the building company, we are in the middle of a process to find solutions for the faulty elements. But it seems that it might be a lengthy process, because right now nobody is sure what has caused the problem and if it can be fixed simply by replacing one part. It's a kind of exploration for us, the building company, and the electricians who have visited so far. (Email, Family B)

Thus, the script inscribed by the designer was not realized: the automated systems required efforts by occupants and did not match the promises and expectations. After living in the house for a year, it still did not function 'normally'. Even though one fault was found, as described above, and the building company changed the faulty part, the temperatures in the winter remained at 19 °C, despite adjusting the central and local thermostats to a higher temperature. The dwellers did not necessarily think that 19 °C was unacceptable as a living temperature, but rather it indicated that the house was not functioning normally, and the fault needed to be found within the guarantee period. As their first winter in the house was relatively mild, it remained unseen what the indoor temperatures would be in extreme cold weather. During the first winter, the lower temperatures compared with their previous apartment resulted in some adjustments, such as putting on more clothes, and it was also noticed that the house warmed up by a degree or so if there were more than three people in it.

Modes and phases of practice formation

Assessing the engagements with heat

In our analysis of the dynamics between houses and occupants in the course of moving in, we started by considering the interface and the media that were at

play when potential occupants anticipated the heating practice. People command various types and levels of knowledge regarding houses, construction materials, and heating systems, and they complement this knowledge with further sources such as Internet forums, peers, and comparative house visits. Based on such pools of knowledge, a house might be, for example, (dis)qualified as being a type of house that is built during an (un)favorable construction period.

Publicly shared understandings and the experiences of peers living in detached houses are, however, not the only ways to anticipate dwelling practices. Brands of building companies, as well as the characteristics of the neighborhood and the previous dwellers help in making sense of the house. However, some of these attributes of quality can be formalized and made calculable: house and its heating system can be described, for example, by referring to an energy performance certificate, energy expenses, an expected technical life time or 'investment deficit'. All of these quantify the house in a less contextual and more standardized way. Once the house is placed in a calculative frame, it can be evaluated and compared with other houses, no matter who built or owned the house, and no matter what the age of the house is.

Even if there is interest, it may be difficult to grasp how the heating system operates before moving in. One reason for this is that practical knowledge of less common but engaging heating arrangements such as pellet systems and passive houses has not been circulated as efficiently as knowhow on other more 'rooted' technologies such as wood heating, which has long been common in Finland. For instance, in one of our cases, pellets as a heating form 'fitted' the family easily on the level of meanings, but as it turned out, the family found little grounds to evaluate the heating solution on the level of practical performance (Interview A).

This all suggests some practice in becoming prior to moving in. Users draw on peer experience and set-ups in which houses are made comparable by formalizing knowledge. As has been shown, occupants use simplified measurements as a basis for residential energy performance (Kempton and Montgomery, 1982), but they also do so before housing purchases. However, heating systems seem to be regarded as both malleable and of only minor concern in the task of finding a house and selecting one in the market place. It follows that much alignment takes place in closer contact with the house.

Renovating as an act of bringing together

Ideally, when planning for housing purchases, there are many options to choose from, and thus a good 'match' with the house and its new occupants could be anticipated. However, heating systems appear not to be the primary decision criteria, and as heating solutions do not figure as a sales argument (Aune, 2012), dwellers frequently end up living with a heating system they did not choose themselves. It thus follows that the new occupants familiarize themselves with the heating conditions to make renovation plans that aim to fix the situation and put together an acceptable form of heating practice.

Most of our interviewees assessed their purchase as a combination of a good bargain, idiosyncratic characteristics that fitted their preferences, and a plan of

renovations to be carried out, whereas different forms of non-fit were more difficult to assess. One of the recurrent patterns was, however, to end up with a more extensive renovation project than initially planned. One house from among our empirical cases (Interview H) was located in an expensive area, but its poor condition made it a tempting offer for the family. It was clear that some renovation in the kitchen and bathrooms was needed. However, the city stipulated that they use an architect, who, in the end, contributed to a far more extensive combination of renovation and new building of additional parts to the house. In the interview, the male owner contended that it was good to do things at once. At the same time, the family's resources had been pushed to the limits and the schedule of the project had been extended.

In turn, interventions by various experts can also downscale the plans. In one of our cases, the family had reason to buy a large house with oil heating with the accepted idea that such systems can and should be replaced with a ground-source heat pump (Interview E). However, the technical survey that they commissioned noted that the technical lifespan of the system was far from being exhausted, and the family reconsidered the plan that had been an elementary part of the purchase. More broadly, it seems that technical surveys bear witness more to the logic of the house, as they may override and disregard user preferences such as low carbon living.

The processes of finding things out, settling in, and learning how the house and the heating system work can be very long. In one of our cases, the new owners moved in with an idea that they would first try out the house and only then decide what changes were needed. Indeed, there was a change in plans and priorities away from the maintenance of the outer surface of the building to installing a ground-source heat pump. Obviously, this type of strategy is partly, as in their case, also driven by the need to spread the costs of acquisition and renovation. However, we also found support for the logic of first living in the house and learning how it works, and only then considering the technical means for the alignment of the house and its new occupants.

A thorough renovation is one way to seek a balance. However, plans appear to be difficult to make and subject to various outside interests. Consequently, plans unfold in time as occupants familiarize themselves with the house before and after market transactions, gather information, engage with various technical experts and regulations, negotiate financing, and in these processes also renegotiate their preferences. While renovations can be viewed as active contestation with the house and previous occupants, this need not happen prior to moving in, but the materials, residents, and practice of heating come together.

The piecemeal coming together of heating

Beyond this image of active remaking of the house and material elements of heating practice, a number of tensions and opportunities for aligning await the occupants after moving in. When aligning with the house, the new dwellers submit to the material orders of the heating arrangements. In one way, they behave in line with the house and adopt the multiple material, bodily, and social enactments that space heating entails. If there is sufficient know-how, and the forms of provision enable a fluent and uncompromised flow of everyday

activities, such alignment can be unproblematic. However, aligning refers to the process of learning how the elements of practice link to each other as means to keep warm conveniently and meaningfully, which may imply active negotiation. Dwellers may be both unaware of and uncomfortable with the ways that the house suggests them to operate.

In several of our cases, it was revealed over time through different dubious, disturbing, or alarming hints that the house did not function as expected, and the hints were eventually acted upon because of the desire to fit. A deficiency in knowledge of how the house functions was accentuated if the technological systems did not provide guidance or prompt a further search for information, knowledge of the functions of the system, or skills. The prefiguration does not take effect when it does not guide the user, such as in the case of the passive house (Interview B), or it can be unclear whether it provides confusing information (Interview A). It remains unclear for the occupants how the house should or could behave. The flexibility and ease of use of the heating system, for instance the combination of a wood stove and electric heating, along with other backup or complementary systems, obviously made the fitting easier.

Discussion

When analyzing the dynamics between a house and the dwellers, we find that the process of formation involves re- and de-linking of elements of the practice of heating and reaches beyond the non-relational technological manifestation. Entrenched material arrangements may homogenize practices, but houses still differ and have idiosyncratic properties. Moreover, whereas technologies may be planned to promote certain ends, such as sustainable forms of energy provision, and include closed scripts and normative ways of their use, the ways in which technologies are embedded in the broader material arrangements and how dwellers encounter and make use of them differ.

People move into a house with very different understandings of thermal comfort and heating: they can see it as seemingly irrelevant or relevant, and they can assess and value it from various perspectives such as aesthetics, costs, convenience, and environmental questions. Heating systems are thus assessed in terms of how they appear at first sight, how they support the practices of everyday life, and also in terms of their wider consequences. Furthermore, the adoption of new technology implies local adaptation, which for long-lived goods such as houses extends temporally through retrofitting.

Importantly, there is rarely such a thing as the first encounter of the user and the practice of heating. While dwellers as carriers of practices certainly encounter elements that are new to them at the moment of moving, the trajectories of practitioners and the multiple elements of practices link over time, and these links can be more or less dormant and resurrected at the moment of moving in (see also Rinkinen, 2013; Maller and Strengers, 2014). This can take place in the minds of practitioners: as noted, material configurations of houses relate to memories, and thus houses mediate experiences and values over time (Dong et al., 2014). It follows that the local arrangements of heating in a specific location thus resonate with broader

understandings of proper living and have an ability to inform and reproduce the practices of new occupants with more or less coercive scripts that are not only material but also social and distributed.

The prefiguring momentum of houses is formed as it brings on the past arrangements and is open to future modification. Material objects anchor certain paths beyond the mind of the practitioner (Schatzki, 2010), but there are nevertheless a number of reasons why materials should be taken as deterministic. Design is largely responsive to the existing standards of living and the resulting market demand, and hence houses partly materialize existing ideas. However, even if novel and disruptive, designs can seldom force or inhibit particular behaviors, despite some vivid counter examples such as Robert Moses' designs in Manhattan (Winner, 1980). Moreover, material objects are often not closed but open to local configuration.

Our analysis highlights not only the variations between different ways of heating, but also the different routes of alignment in reproducing social practices such as heating. This speaks for the idea of 'negotiated' and relative prefiguration, where both the house and the new dweller are involved in a dynamic process of alignment. For example, the couple with the wood and pellet stove clearly responded to the excess toil of their system with both new practical arrangements and by reconsidering the acceptability of electric heaters. In this frame, technologies and their constellations may be understood as prefiguring artifacts, which are shaped by and shape the practices humans carry out in interaction with, around, and through them. In this sense, there is no such thing as an 'ideal' dweller.

Constellations of technology also ask for different levels of involvement and have different binding natures in terms of the skills, time and material settings that are needed to interact with them. As Schatzki (2010) suggests, materiality can be analyzed in terms of the flows that pass through practice–arrangement nexuses. In the case of heating, managing the flows of resources and maintaining the systems constituted in some of our cases a rather active form of heat and heating, which challenges the representation of infrastructure as providing a static, atemporal service flow (Furlong, 2010). It also prompts us to reconsider flexibility: for example, small-scale wood heating brings flexibility, as it allows variation in indoor temperatures over time and space, liberates the users from market expenses, and enables them to react to disruptions in the electricity supply, but it also brings a cluster of inflexibilities, as it requires active attentiveness during cold spells, and it demands a certain level of skill and physical condition from the occupant. This demonstrates that heat management can form a lively nexus of interrelated practices through which practitioners become more or less involved in radiating warmth throughout their homes.

Conclusions

In this paper, we present a study on the modes and phases of practice formation to understand the role of the house in this formation. We show how practitioners align with the materiality of the house and thus form new practices of heating in a process that takes place both over time at a distance and also in

close engagement with the material arrangements. The practices and their elements (meanings, materials, and skills) balance between practitioners and broader structures. We find that the formation of practices relates to two interlinking dimensions of a practice: first, the longitudinal nature of practice formation across time and the position of houses within this process, and second, the flexibility of the practice and material arrangements.

Houses gather the repetitive, mundane flow of daily activities, and they are also a space for practices to emerge, disappear, reproduce – and be formed. Houses take part in delivering heat and thermal comfort for people, their pets, and material belongings, and underlie the practices that go on within the house. When thinking about energy demand in particular, houses stand out as a junction node for the flow of energy services such as heat. As heating arrangements become more varied, houses are becoming more complex spaces where the work for heating and the flows of heat require new kinds of temporal engagement and skills from the dwellers.

Achieving substantial energy reductions requires ongoing monitoring of energy use and thereby a more intimate working knowledge of the house than has typically been required of the modern home dweller. Notably, energy use is also tied into the rhythms of demand and patterns of daily living, and it is not only knowing about the house but also knowing how the house fits into and configures such patterns – again, something that is more than has typically been required of the modern dweller. This is to some extent acknowledged by actors who promote new technologies if their efforts arise from immediate practical considerations (Heiskanen et al., 2011). It is still worth further emphasis that rather than asking why and how energy renovations are made, questions exposing the co-existing and co-aligning systems for keeping warm need to be raised.

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