UiO : University of Oslo

User Adoption of Innovations in a Sustainability Transitions Context

A Practice Theory Analysis of Car Sharing and Urban Mobility Behavior in Oslo

Cyriac George

Master's Thesis
Centre for Technology, Innovation and Culture
Faculty of Social Sciences
University of Oslo

Spring 2017

2017

User Adoption of Innovations in a Sustainability Transitions Context: A Practice Theory Analysis of Car Sharing and Urban Mobility Behavior in Oslo

Cyriac George

http://www.duo.uio.no/

Trykk: Reprosentralen, Universitetet i Oslo

Acknowledgements

I would like to thank my two thesis supervisors, Erling Holden and Tuukka Mäkitie at the TIK Centre. Your guidance over the past year has helped give form to a project that was, at times, too ambitious for its own good. Your feedback and encouragement were always precise, honest and constructive. Your patience for tangents did not go unnoticed.

Equal thanks to Tom Erik Julsrud at the Institute of Transport Economics and the rest of the TEMPEST project team, including Ove Langeland, Eivind Farstad and Tanu Priya Uteng. I am grateful for the level of trust you showed in me as well as your generosity in terms of time, effort and resources. The research you carry out not only inspires me but also serves as a bridge between the theories we use and their bearing in the real-world contexts we examine. It has truly been a pleasure collaborating with you this past year.

Thanks also to all the informants for offering your time and inviting me into your homes – this thesis is, more than anything else, an analysis of your experiences. Special thanks to Allan Dahl Andersen at the TIK Centre for unwittingly being my unofficial academic advisor for much of my time at the University. Thank you for always keeping your door open to me and allowing me to harass you with ideas in the corridors.

Abstract

Car sharing is an emerging innovation that may contribute to a transition to a more sustainable mobility system. Although it does not represent a radically new technology, car sharing challenges the foundations of the current mobility system, which is based on private ownership. Much of the literature on sustainability transitions uses socio-technical tools like the multi-level perspective and transition pathways typology, which have been useful for analyzing innovation from a macro, top-down perspective, but are less useful for analyzing micro-phenomena and capturing user perspectives. Practice theory is an alternative approach to studying human behavior and societal change that decenters the human agent and focuses on everyday activities and the formation of habits. Using practice theory, this thesis investigates mobility behavior and user adoption of car sharing platforms in Oslo to gain insights into critical aspects of a socio-technical transition in its nascent stages.

Based on in-depth interviews with seven households living in Oslo, this thesis provides new understandings related to the materials, competences and meanings associated with car sharing. Car sharing is also contextualized among other important practices, chief among them, residency. I argue that the strength of car sharing is that it maintains many of the practices prevalent in the incumbent regime, and that, in Oslo, it is a distinctively urban phenomenon that attracts distinctively urban users who engage in the practice because it helps them achieve a preferred lifestyle. Although this thesis does not provide a blueprint for car sharing promotion or the enactment of a transition, its comprehensive analysis of innovation adoption and real-world use offers useful insights to inform future research and policy.

Table of contents

1 Introduction

In this section, I will introduce my research area and topic, and then delve into the latter by elaborating on and emphasizing the relevance of sustainable urban mobility, car sharing, and Oslo as an urban mobility context. I will conclude by outlining the remaining sections in this thesis.

1.1 Research area and topic

The broad **research area** for this thesis is socio-technical transitions, which characterize innovation and systemic change as a radical, long-term, co-evolutionary process that involves the interaction of various actors, operating at multiple levels towards the fulfillment of a societal function (Rip & Kemp, 1998; Geels, 2002; Geels 2004; Smith, Stirling & Berkhout, 2005). The socio-technical function at issue in this project is urban mobility, which can be understood as the *ability* to move through physical space within cities. Transportation, similarly, can be understood as the actual *act* of the movement.

The **research topic** that is the focus of this thesis is car sharing in Oslo as it relates to sustainable urban mobility. I investigate mobility behavior and user adoption of car sharing platforms in Oslo to gain insights into potentially critical components of a socio-technical transition in its nascent stages.

This thesis is primarily intended for researchers and policy makers interested in understanding and potentially influencing a transition to sustainable mobility. It is grounded in innovation studies and the transition literature, but will also use analytical tools and concepts from sociology and the study of sustainable development. This thesis adopts a socio-technical backdrop, which is to say that it views transitions as systemic phenomena that are the result of not only technical innovations but also social and organizational ones. Prominent socio-technical tools like the multi-level perspective (MLP) and pathways typology have been good for describing top-down and supply side phenomena, but are less developed when it comes to bottom-up and demand side perspectives. As such, I use practice theory to analyze mobility behavior and user adoption of car sharing in order to understand how and why people use car sharing. The following research is qualitative in nature and focuses on Oslo, Norway, not because it is a typical or representative case city, but because it is a context that, as

Thomas (2011, p. 514) said about good research subjects, is interesting and revealing with respect to the body of literature and analytical framework employed.

The research topic is also of general interest because of the universality of mobility as a societal function and of climate change as a phenomenon that impacts every human. I am not interested in whether or not car sharing will lead to sustainable mobility transition – such a topic is far too large for the scope of a master's thesis. I am more interested in how users engage with an innovative mobility solution in a city that is actively promoting a mobility transition. I have two research questions that will be used in pursuit of this understanding.

1. How does the car sharing relate to other practices for urban households in Oslo?
2. Why do urban households in Oslo use car sharing services?

By focusing on user practice, I hope to bridge the gap in understanding between the innovation promotion and uptake, and comment on how and why innovation can succeed and fail.

1.2 The need for sustainable mobility

There is a broad consensus in the international scientific community that the earth's atmosphere is warming and that human activities are, at least in part, the cause (Cook et al., 2016). In virtually every arena of climate change discussion, there is increased recognition that a mobility system based on privately owned fossil fuel driven automobiles, which will be referred to herein as automobility, is unsustainable (Kemp, Geels & Dudley, 2012, p. 8; Schippl, et al., 2016; Hodson, Geels & McMeekin, 2017). At the first ever United Nations Global Sustainable Transport Conference in November 2016, the United Nations Undersecretary General, Wu Hongbo, stated categorically:

> "Simply put, without sustainable transport, there will be no lasting progress on climate action; without sustainable transport, there will be no lasting progress on the Sustainable Development Goals" (United Nations, 2016).

There are more than 1.7 billion fossil fuel driven motor vehicles registered around the world today (World Health Organization [WHO], 2015). The costs associated with this magnitude of automobile use has compelled many to question fundamental aspects of the mobility system. "Even in the most conservative view, conventional motorization, vehicles, and fuels

threaten an economic and environmental cataclysm" (Sperling & Gordon, 2008, p. 3). Arguments for moving beyond automobility are made, first and foremost, on environmental grounds, with a focus on greenhouse gas (GHG) emissions, climate change and local pollution (Kingsley & Urry, 2009).

The global transport sector accounts for approximately 23% of the world's energy related CO_2 emissions, and despite improvements in efficiency, this figure has risen in recent years and is expected to continue rising in the coming years (Intergovernmental Panel on Climate Change [IPCC], 2014, p. 603). Policy and market interventions have also failed to curb the trend (Kemp, Avelino & Bressers, 2011, p. 25; Schwanen, Banister & Anable, 2011, p. 993). Marsden and Rye (2010, p. 669) claim that "transport is the sector from which it has been hardest to cut emissions".

The costs of fossil fuel driven automobiles is not, however, limited to what comes out of the tailpipe. The negative externalities of automobility include: the carbon footprint associated with vehicle manufacturing, fuel production and transportation infrastructure; the health costs for those living in or near polluted areas; and the social and economic costs of infrastructure-related resettlement and commute patterns (United Nations Center for Human Settlements [UN-HABITAT], 2001; Kemp, et al., 2012, p. 8; Becker, Becker & Gerlach, 2012). Furthermore, automobile collisions are the leading cause of injury-related death and the tenth leading cause of death overall in the world, just behind tuberculosis and diarrheal diseases (WHO, 2017). It should be noted that about half of the more than 1.3 million collision-related deaths per year involved pedestrians, bicyclists and motorcyclists, who are classified by the WHO (2016) as 'vulnerable road users'. To say that automobility is unsustainable is not to focus on one particular problem – one must take into consideration the myriad costs associated with the entire mobility system.

Many have called for a transition to a more sustainable mobility system, but such efforts are constrained by the extent of our dependence on automobiles and unwillingness on the part of policy makers and industry leaders to appropriately acknowledge the extent to which this is unsustainable. Actors within the automobile industry, for example, have been so preoccupied with market saturation and cost savings over the preceding decades, that they have not effectively prioritized climate change in a manner that would have encouraged the radical innovations needed for a low-carbon transition (Geels, 2012, p. 478). If anything, current

industry efforts to produce ‘greener’ alternatives are driven more by ‘hedging or reputation strategy’ than climate change (Sperling & Gordon, 2009 as cited in Geels, 2012, p. 478).

The approach of the Norwegian Government has been one of balancing expected increases in mobility demand with a ‘zero growth objective’ in urban areas. This is to say that despite the need for more transportation capacity and effectiveness to accommodate a growing population and economy, “growth in passenger transport in cities is to be absorbed by public transport, cycling and walking” (Norwegian Ministry of Transport and Communications, 2017, p. 145). It cannot be taken for granted, though, that such policies seeking to limit automobile use will remain in place from one administration to the next. The importance of Oslo within the Norwegian context as well as the broader efforts for a sustainable mobility transition will be elaborated upon later in this section.

1.3 Car sharing: what it is and why it is worth studying

In this sub-section, I will (1) define car sharing and provide background information on car sharing in Oslo; and (2) argue why car sharing is important in the context of mobility transition.

1.3.1 What is car sharing?

If automobility refers to a mobility system in which the predominant mode of transportation is privately owned fossil-fuel driven cars, then car sharing, as it will be used in this thesis, refers to multiple users having access to individual cars on a short-term rental basis through a formal service provider or intermediary.

When discussing automobiles intended for multiple users, some ambiguities arise with respect to terminology. Mainly, car sharing is often confused with ride sharing and ride sourcing. The clearest distinction is that car sharing offers access to a vehicle that is operated by the user whereas ride sharing and ride sourcing offer access, as a passenger, to a vehicle that is operated by someone else. The Shared Use Mobility Center provides the following definitions (Shared Use Mobility Center [SUMC], 2016, p. 5-8):

- Car sharing: “a service that provides members with access to an automobile for short-term - usually hourly - use”.

- Ride sourcing: “platforms to connect passengers with drivers who use personal, non-commercial, vehicles”.
- Ride sharing: “adding additional passengers to a pre-existing trip...Unlike ride sourcing, ride sharing drivers are not ‘for-hire’”.

There are some forms of automobile access-without-ownership that will not be considered car sharing in this thesis. Car leasing, which typically lasts for years at a time and provides exclusive access to the leaseholder, mimics the actual ownership of a vehicle and does not assume multiple users during the lease period. Traditional car rental services can be short term, but are more often available on a daily basis, not hourly, making it difficult, if not impossible, for multiple users to have access in the same day.

There is also a difference between formal or organized car sharing, as opposed to informal or private car sharing. “The distinctive criterion is whether a central service structure exists that co-ordinates the activities of multiple users of a car and whether any legal form of association exists that own the cars. In private car sharing, it is usual for one person to hold legal ownership rights to the car, and access to the car is organized in an informal way” (Truffer, 2003, p. 154). Informal car sharing can be as simple as friends or family members borrowing a car from one another – even hitchhiking is an example of informal car sharing. This thesis will consider both types, but will focus on formal car sharing.

There are three main business models for formal car sharing service providers: corporate, cooperative and peer-to-peer (P2P). By far, the most prominent of these internationally is the corporate business model. A large part of this is because many incumbent firms, namely automobile manufacturers and rental car companies, have invested heavily in car sharing services. For example, three of the largest car sharing companies in the world, car2go, Zipcar and DriveNow are subsidiaries of the Avis Budget Group, Daimler AG, and BMW/Sixt, respectively.

The car sharing market in Oslo, on the other hand, is dominated by Bilkollektivet, which is a user-owned cooperative. Bilkollektivet has been operating for two decades and resembles many of the earlier European attempts at formal car sharing, which were predominantly operated as non-profit cooperatives (Shaheen, Sperling & Wagner, 1999). The main corporate providers in Oslo are Hertz, a rental car company, and MoveAbout, a newer company that offers a 100% electric fleet of cars. The newest competitor in the market is Nabobil, which is

a P2P service that allows members to rent out their privately owned vehicles to other members. This is very similar to AirBnB, but for personal automobiles.

Use of car sharing requires membership or some basic registration, which includes submitting the user's driving license for approval. All of the car sharing platforms in Oslo are two-way (as opposed to point-to-point), which means that the cars must be picked up and dropped off at the same location. There are large variations in the size of vehicle fleets, types of vehicles, pricing schemes, and levels of supply and demand.

1.3.2 Why study car sharing?

Car sharing is important and interesting from a mobility transition perspective for two main reasons: (1) car sharing has an impact on mobility behavior in ways that can change the automobility system; and (2) it is a form of collaborative consumption that is part of the growing sharing economy.

First and foremost, car sharing has the potential to transform the mobility system by attacking the fundamental logic of automobility – that users must own private vehicles. Car sharing has been shown to significantly reduce the number of cars on the road, by both preventing and delaying the purchase of private automobiles (Kent & Dowling, 2013, p. 87; Firnkorn & Müller, 2015, p. 30). Studies have shown that each shared vehicle can replace between 7 and 13 private vehicles (Shaheen & Cohen, 2013, p. 2; Martin & Shaheen, 2016, p. 24). Given the magnitude of this difference, car sharing certainly has the potential to disrupt the pattern of private car ownership that is so prevalent in automobility.

Car sharing also has an impact on other non-automobile based modes of transport. While car sharing is associated with significant increases in walking, biking and carpooling, it is also associated with slight decreases in the use of public transport (Martin & Shaheen 2011, p. 2094; Martin & Shaheen, 2016, p. 13). From a transitions perspective, the ultimate 'success' of car sharing will depend on its ability to foster more sustainable modes of transportation. We cannot, however, take for granted that the findings of prior studies are replicable and that car sharing in Oslo will have the same effects on automobile traffic and other modes of transportation as it has in other cities. There is even the possibility that car sharing can exacerbate the problems of automobility by encouraging more, albeit shared, car use.

Much of what we know about the systemic impacts of formal car sharing comes from preliminary research in particular contexts, which should not come as a surprise considering that it is a relatively new form of mobility. As car sharing grows in popularity, more research will be needed in order to get a fuller understanding of how it relates to the mobility system. It should be emphasized here that the purpose of this study is not to measure the impact of car sharing on the mobility system, but to examine its adoption and use, in such a way that can inform the larger discourse on mobility transition.

Secondly, car sharing's focus on the shift from ownership to access embodies many of the values and practices associated with the sharing economy. Although the origins of the term 'sharing economy' are contested, the earliest scholarly work to use it is Lessig's 2008 book *Remix*, which stated that the sharing economy has, in a sense, always existed by virtue of people voluntarily sharing resources – the difference now is that it has been monetized and formalized using information and communication technology (Lessig, 2008, p. 117).

This mirrors the distinction between informal car sharing, which has been around for as long as automobiles have existed, and formal car sharing, which is a relatively new phenomenon that is enabled by recent technological innovations and changes in consumption patterns. In particular, electronic services and markets, mobile devices, social networks, and shifts in consumer behavior have all been drivers of the sharing economy (Puschmann & Alt, 2016, p. 93). Furthermore, the status associated with personal car ownership has diminished in recent years, especially among young urban residents (Davis, Dutzik & Baxandall, 2012).

This is to say that despite its historical antecedents, the modern sharing economy refers to new forms of collaborative consumption, or "peer-to-peer-based activity of obtaining, giving, or sharing the access to goods and services, coordinated through community-based online services" (Hamari, Sjöklint & Ukkonen, 2015, p. 2047). This certainly applies to the car sharing platforms available in Oslo, all of which are operated through a smartphone app or a website – it in entirely possible to be a car sharing user without ever having to directly interact with another human being from the car sharing company.

Furthermore, car sharing is just one among many forms of shared mobility that place a greater emphasis on access (for multiple users) rather than ownership. Such transportation services include, but are not limited to public transit, taxis, bikesharing, carsharing, ridesharing, ridesourcing, and shuttle services (SUMC, 2017). Some forms of shared mobility are not even

vehicular - a sidewalk or pedestrian pathway, for example, can be thought of as part of a shared-used mobility system insofar as it is almost always accessible to multiple users. Although the criteria for shared mobility may vary, it is easy to juxtapose it with what it definitely is not. Just about the only forms of transportation that would not be considered shared mobility are privately owned vehicles intended primarily for one user – the heart of the automobility system. Seen within the context of the sharing economy, and shared mobility in particular, the use of car sharing may shed light on broader shifts in mobility behavior as it relates to the automobility system.

1.4 The importance of Oslo as an urban mobility context

Oslo is an interesting city to focus on because it is the site of concerted and long-term efforts to transition away from automobility. This makes the city relevant not just for car sharing but all forms of innovative mobility. Appreciating the significance of Oslo requires that we consider what such a transition away from automobility may look like. In the preface to the 2012 book *Automobility in Transition*, Kemp, Geels and Dudley stated (2012, p. xii):

> "...we do not take for granted that a transition to sustainable transport will happen...If a transition will take place, a further question is what kind of path will it follow? Will a future sustainable transport system be based on 'green' cars? Or will this system look very different from our current transport systems, with intermodal linkages between various sub-systems and less prominence for cars?"

I will refer to the two scenarios described above as visions, because they are not just theoretical concepts, but relate actual policies and campaigns that have been proposed and/or implemented in cities throughout the world. These two visions are not necessarily mutually exclusive, but there is certainly some inherent tension. One of the best cities in which to observe this tension is Oslo, where many of the recent mobility-related developments and debates can be characterized as being either a dialogue or contest between these two visions. On the one hand, Oslo is a leading city in the world in terms of the deployment of 'green cars', which in this context refers to electric vehicles. On the other hand, Oslo is also aggressively pursuing policies that discourage the use of cars, irrespective of fuel source.

In terms of the push for greener cars, although Oslo has no significant research and development infrastructure related to electric vehicle technology, it has been at the forefront

of consumer adoption and market penetration. A combination of national and local policies and programs that aim to encourage electric vehicles has resulted in phenomenal sales – so much so that Oslo is regularly referred to as the 'electric vehicle capital of the world' (Oslo Municipality, 2017a; Hall, Moultak & Lutsey, 2017; Van Der Pas, 2014; Mega, 2016, p. 142).

The various incentives for purchasing and using electric vehicles include exemption from initial and recurring registration fees, exemption from toll on all national roads and ferry charges, free municipal parking, free electric charging stations, and the ability to drive in collective lanes on motorways (Oslo Municipality, 2017a; Norwegian Tax Administration, 2017a; Norwegian Tax Administration, 2017b; Norwegian Automobile Federation, 2016; Pedersen, 2014; Norwegian Ministry of Finance, 2016). Although it is still early in terms of any potential mobility transition, these policies seem to be working. There are more than 35,000 electric vehicles in the Oslo region and more than 30 percent of all new cars sold in Oslo in 2015 and 2016 were battery electric vehicles (BEVs) or plug-in hybrids (Oslo Municipality, 2017a). To put the pace of change into perspective, there were only 3,000 registered electric vehicles in all of Norway in 2010 (Norwegian Electric Vehicle Association, 2016).

Although Oslo's electric vehicle credentials are undeniable, its efforts to move beyond automobility, through intermodal linkages and less prominence for cars, are less obvious at first glance. For the most part, this approach manifests through policies that discourage automobile use and promote dense urban planning, public transit, walking, and bicycling. These efforts have been accumulating for decades.

Starting in the 1980s, Oslo put a halt to peripheral land-use development and initiated a policy of limiting sprawl and promoting urban density (Guttu as cited in Rygnestad, 2014, p. 2), an approach that has remained remarkably consistent to this day. The most recent *Kommuneplan* (Municipal Plan), the chief strategic management document for municipal administration, explicitly sets the goal of demographic and economic growth through compact city development and transit-based densification (Oslo Municipality, 2015, p. 34). Furthermore, the *Regional plan for areal og transport i Oslo og Akershus* (Regional plan for land use and transportation in Oslo and Akershus), which serves as a common strategic platform for the coordination of land use and transportation planning in the Oslo metropolitan area, states as one of its main objectives: "…the transport system will be effective, environmentally friendly,

universally accessible, and with the lowest possible dependence on automobile transport" (Oslo Municipality & Akershus County Council, 2015, p. 9).

The most ambitious aspect of this vision is the city's plan, formerly known as *Bilfritt sentrum* (Car-free city center), now rebranded as *Bilfritt byliv* (Car-free city life), to effectively eliminate private cares from the downtown area. If implemented, this would create the largest car free city center in Europe (Tønnesen, Meyer, Skartland & Sundfør, 2016). The plan will begin in the summer of 2017 when all surface parking in the city center will be eliminated in order to make more space for pedestrians, cyclists, public transit and other non-mobility uses (Oslo Municipality, 2017b).

Additional efforts to discourage automobile use include the introduction, in 2017, of congestion pricing, not only for driving into and out of the city, but also for driving within the municipal boundaries (Oslo Municipality, 2017c). The city is also rapidly expanding bicycle infrastructure, which will be made possible, in part, by eliminating thousands of municipal parking spaces (Røed, 2016, Løken & Eggesvik, 2016). Oslo also has a popular public bicycle sharing system, Bysykkel, with which approximately 50,000 users[1] took more than 2.1 million trips between April and November 2016 (Oslo Bysykkel, 2017). All of these efforts are in line with the National Government's 'zero growth objective', which states that "growth in passenger transport in cities is to be absorbed by public transport, cycling and walking" (Ministry of Transport and Communications, 2017, p. 145).

Any one of these elements would not be remarkable in and of itself, insofar as a transition is concerned, but put together, they offer a radically new vision for how a city is built and how people should get around within it. The most significant takeaway is that Oslo is aggressively pushing multiple visions to dismantle automobility, which makes it a particularly interesting and relevant city for any inquiry into mobility transition.

An important question to ask at this point is, do these visions in Oslo have any particular relevance for car sharing? The answer is an emphatic yes, and the reason is because car sharing is uniquely compatible with both of the visions described above. In a context such as Oslo, car sharing is relevant and interesting because it can be viewed as a potentially significant overlap between these two potentially conflicting visions for sustainable urban mobility. When addressing the problems of automobility, green car advocates see the fuel

[1] The population of Oslo is approximately 667,000 (Oslo Municipality, 2017d)

source as the main problem whereas intermodal advocates see the car itself as the problem. Car sharing, rather than eliminating car use or developing greener cars, challenges the ways in which we use them. A green car future could very well have a significant share of shared electric vehicles, and similarly, an intermodal future could just as easily incorporate shared cars as one among many modes of transport.

This thesis does not intend to provide a comprehensive account of the transition related activity being carried out in Oslo. The city was chosen because it is an interesting urban context for studying the transition from automobility.

1.5 Thesis Outline

In the preceding introductory section, I presented my research topic and provided background information on its constituent elements, namely, sustainable mobility, car sharing and Oslo, and highlighted the relevance of each with respect to the research area.

In Section 2, I will review the academic literature relevant to my research topic. I will begin by describing the development and use of the socio-technical systems approach and relate it to the concept of automobility. I will then address weaknesses with this approach and discuss how practice theory is a potential solution.

In Section 3, I will present my analytical framework, which will come from the existing literature on practice theory. Firstly, I will show how practices can be broken down into their constituent elements for analysis. I will then describe the mechanisms of change whereby practices, like car sharing, can emerge, grow and end.

In Section 4, I will describe the methods with which I collect and analyze data in order to answer my research questions. This will include explanations of how I use the qualitative research approach, in-depth interviews, targeted sampling and coding to help to reach my conclusions.

In Section 5, I will present the empirical results of my in-depth interviews using the elements of practice and mechanisms of change as a framework to organize and analyze prominent themes obtained from the interview data.

In Section 6, I will expand on the significance of the interview results with respect to my research questions and the study of sustainable mobility transitions. This will include

elaborations on how practice theory was able to inform the socio-technical approach. This section will conclude with recommendations made by informants for improving car sharing in Oslo.

In Section 7, I will present my conclusions and address the extent to which the research conducted was able to answer my research questions. I will conclude this thesis by presenting the theoretical and policy implications based on my research.

2 Literature review and research questions

In this section, I will review literature from two analytical approaches: socio-technical transitions and practice theory. I will begin by introducing the socio-technical approach to transitions and describing the MLP and transition pathways typology. I will then expand on the literature concerning automobility and relate it to the MLP and socio-technical approach. I will then identify some of the key limitations and weaknesses of the MLP and socio-technical approach and present practice theory as an analytical approach that can address these shortcomings in a way that can help answer my research questions and inform the general mobility transition discourse.

2.1 Transitions and automobility

2.1.1 The socio-technical approach

> "A transition can be defined as a gradual, continuous process of change where the structural character of a society (or a complex sub-system of society) transforms. Transitions are not uniform, and nor is the transition process deterministic: there are large differences in the scale of change and the period over which it occurs. Transitions involve a range of possible development paths, whose direction, scale and speed government policy can influence, but never entirely control." (Rotmans, Kemp & van Asselt, 2001, p. 16).

There are many theoretical approaches to study transition. Among them, prominent ones include transition management, strategic niche management, technological innovation

systems, and the multi-level perspective on socio-technical transitions (Markard, Raven & Truffer, 2012, p. 955). This thesis will focus on the last of these approaches as a theoretical backdrop.

The term transition was used as early as 1945, when Kinsey Davis used it to describe the demographic changes that took place in Europe during the Industrial Revolution as having "involved economic, social and political changes equally as fundamental as the technological" (Davis, 1945, p. 1). In the decades that followed, contributions from the fields of evolutionary economics (Nelson & Winter, 1977; Dosi, 1982) established a coherent theoretical framework with which to study transitions, with a particular focus on technological innovation.

Scholars from the fields of science, technology and society (STS) and the history of technology provided a more complex understanding of transitions by introducing the concept of technological systems, according to which technology is both a social construct as well as society-shaping, and is viewed as being constituted by a set of distinct but interlocking material, organizational and environmental elements (Hughes, 1983; Bijker, Hughes & Pinch, 1987). Concurrently, the growing emphasis on the "interaction of men, ideas, and institutions, both technical and nontechnical, led to the development of a supersystem – a sociotechnical one – with mass movement and direction" (Hughes, 1983, p. 140).

The key difference between technological transition and socio-technical transitions is that the latter takes into consideration user practices, institutional structures, complementary technologies and infrastructures, and non-technical innovations (Markard, Raven & Truffer, 2012, p. 956). Socio-technical systems like the urban mobility system consist of networks of actors, institutions, material artifacts and knowledge that exhibit a co-evolutionary relationship – the interaction of these elements results in the fulfillment of a societal function (Geels, 2004, Markard, Raven & Truffer, 2012, p. 956).

2.1.2 The multi-level perspective

Within the socio-technical approach, a common way to describe the process of systemic change is the multi-level perspective (MLP), which was originally developed by Rip and Kemp (1998) and elaborated upon by others (Rotmans et al. 2001, Geels, 2002, Geels, 2005, Geels & Schot, 2007, Geels et al. 2016, Hodson, et al. 2017). The MLP conceptualizes complex socio-technical transitions as being constituted by three interacting levels: the niche, regime and landscape.

The socio-technical regime can be thought of as a semi-coherent set of rules and practices that guide the relevant actor groups along technological trajectories. In socio-technical transitions, regimes are the actual things that change. The rules and practices encourage regime actors to pursue gradual as opposed to radical innovations. "Sociotechnical regimes account for the stability of sociotechnical systems. This stability is dynamic, meaning that innovation still occurs but is of an incremental nature, leading to 'technical trajectories' and path dependencies" (Geels, 2005, p. 684)

The landscape is the context within which the regime rules and routines operate. Landscape pressure, which can disrupt the regime trajectory, is thought of as being exogenous because, they arise from outside the set of rules and practices that govern the system. A prime example of a landscape force as it relates to mobility is climate change, which is a long-term phenomenon that has developed over time. Although there is not much that regime actors can do to influence landscape forces in the short and medium term, they can and do adapt to landscape pressure, to the extent possible, so as to maintain the overall stability of the system (Geels, 2002, p. 1260).

Niches are spaces in which new, experimental and potentially radical innovations can develop outside of the regime selection environment. Niches shield immature innovations that are "relatively crude and inefficient at the date when they are first recognized as constituting a new innovation. They are, of necessity, badly adapted to many of the ultimate uses to which they will eventually be put; therefore, they may offer only very small advantages, or perhaps none at all, over previously existing techniques" (Rosenberg, 1976, p. 195). Niche innovations can be incremental, whereby the regime can use it to correct for course and maintain stability, or it can be radical, whereby the regime must completely change course.

Although car sharing, the niche practice that is at the heart of this project, may not involve radically new technologies, the ways in which existing technologies are being used to fulfill mobility needs are indeed different, and have the potential to change the trajectory of the current automobility regime.

The three levels of the MLP form a nested hierarchy, for which Geels articulated a (sub)framework to describe how radical niche innovations make their way 'up' to the regime level (2005, p. 684-5). The first step is the emergence of novelties informed by landscape pressure and regime weakness. The second phase is when the novelty undergoes further

development – access to a small market, extra resources from regime actors, and specialization help to improve and stabilize the novelty. In the third phase, the innovation exploits a 'window of opportunity created by landscape pressure and regime weakness and competes openly with incumbent regime products and services. In the fourth and final phase, the innovation replaces the old regime and thereby changes its trajectory as well as the characteristics of the broader socio-technical system. This description is similar to the predevelopment, take-off, breakthrough and stabilization transition phases articulated by Rotmans et al (2001, p. 17). Subsequent scholarship in the field has tended to place less emphasis on the dynamics of niche-regime integration phases and focus more on transition pathways.

2.1.3 Transition pathways

In order to understand socio-technical transitions using the MLP, scholars have developed typologies that describe various 'pathways' that a transition can take. The most prominent typology, that which has been developed by Geels and Schot (2007), has four pathways: transformation, reconfiguration, technological substitution, and de-alignment and re-alignment. These pathways are "based on variations in timing and nature of multi-level interactions" (p. 399).

The transformation pathway involves gradual regime adaptation in the absence of a sufficiently developed niche innovation. The reconfiguration pathway is similar to transformation with the addition that symbiotic niche innovations are incorporated into the regime and lead to combined, sequential innovations that change the trajectory of the regime from within. The other two pathways both involve sudden and intense landscape pressure that destabilizes the regime. In the case of the technological substitution pathway, there is a niche innovation ready to be taken up into the regime to help correct course. In the de-alignment and re-alignment pathway, however, there is no mature niche immediately available, which means that regimes must be rebuilt using one of the niche innovations. There is also the reproduction pathway, which can be thought of as the 'business as usual' pathway; here regime actors innovate incrementally and maintain overall stability.

Pathways do not exist in isolation from one another. Geels and Schot argued that landscape pressure has the potential to instigate a sequence of pathways starting with transformation,

then reconfiguration and potentially substitution and de-alignment and re-alignment (Geels & Schot, 2007, p. 413).

Comparing the MLP levels and pathways reveals distinct characteristics. The MLP levels "are not ontological descriptions of reality, but analytical and heuristic concepts to understand the complex dynamics of sociotechnical change" (Geels, 2002, p. 1259). Therefore, niches and regimes, unlike actors within the system, do not have agency in and of themselves; they are not persons or organizations, but rather, conceptual tools representing spaces, rules and practices, used to make sense of phenomena. Although pathways are conceptual tools to make sense of emerging phenomena, they can also reflect the explicit efforts of actors within the sociotechnical system. This is why scholars speak of 'enacting' pathways. An updated formulation of the typology, places a greater emphasis on endogenous enactment (as opposed to disparate responses to landscape pressure) of transition pathways and shifts between them (Geels, et al., 2016). When discussing pathways, the main actors are usually governments and firms because they tend to be the ones that possess the power to enact such large-scale change.

2.1.4 The automobility system

Starting in the 1990s the various strands of transition research began tackling the issue of environmental sustainability with the explicit aim of understanding how to promote a transition to more sustainable modes of production and consumption (Markard, Raven & Truffer, 2012, p. 960). There is a growing recognition that our collective technological and economic preoccupation with growth, specialization and efficiency are limiting out institutional and organizational capacity to solve long-term, systemic environmental problems, and that more radical innovations, both technological and otherwise, are needed to transition to a more sustainable future (Loorbach, 2007, p. 16-17). It is against this backdrop that I wish to begin discussing automobility using a socio-technical lens.

> "During the 20th Century developed countries experienced a transition from existing regimes of public transport to a regime of automobility, with the privately owned and driven car as the main means of personal transport. In some of those countries the regime of automobility may have stopped expanding…but it is not at all clear how personal mobility will develop in the face of current pressures" (Kemp et al., 2012, p. 4)

Automobility is a portmanteau that suggests that the automobile is the central artifact of the mobility system. This is not to say that everybody owns a vehicle or that they fulfill the majority of their mobility needs by driving, but that the impacts of automobiles extend beyond their transportation functionality. In other words, a car is more than just an object and driving is more than just a task. Understanding automobility requires that we broaden our scope beyond the transportation artifact and our destinations. We must take into consideration the 'fluid interconnections' that constitute the mobility system (Urry, 2004, p. 26).

Sheller and Urry (2000, p. 739) describe the elements of automobility system as a "complex amalgam of interlocking machines, social practices and ways of dwelling" that can be understood as a unique combination of six interlocking components:

- the quintessential nature of the car as a manufactured object.
- individual consumption and importance of the car as a status symbol.
- the machinic complex, or technical and social linkages with other industries (e.g. parts manufacturers, oil companies, road builders, hotels and suburban developers).
- private mobility that subordinates public mobility
- the dominant cultural discourse that associates cars with the good life.
- environmental impacts associated with automobile production and use.

These interlocking components of automobility can be thought of as a prime example of a socio-technical regime. They are rather similar to Geels' (2002, p. 1258) socio-technical configuration for transportation, which includes: the vehicle/artifact; road infrastructure and traffic systems; regulations and policies; finance and insurance; culture and symbolic meaning; industry structures; maintenance and distribution networks; markets and user practices; and fuel infrastructure.

The problem with the automobility regime/system is not just that we drive too much, or any one of the components listed above, but that the systemic nature of automobility connects it to so many other parts of society. Automobility has "reshaped citizenship and the public sphere" (Sheller & Urry, 2000, p. 739). "The car reconfigures urban life, involving…distinct ways of dwelling, travelling and socializing in, and through, an automobilized space-time…mobility is as constitutive of modernity as is urbanity (and), that civil societies of the West are societies of 'automobility'" (Sheller & Urry, 2000, p. 738). The all-encompassing breadth and

pervasiveness of automobility is important to consider when thinking about if and how a transition is to occur.

The path dependency of the automobility regime has already tipped over into a 'locked in' mode (Urry, 2004, p. 31). Despite the broad consensus regarding many of the problems associated with automobility, it "is deeply embedded in western lifestyle and stabilized through sunk investments, interests vested in its continuation and taken-for-granted beliefs and practices. While the last two decades saw many attempts to introduce radical innovations with higher sustainability performance, the wider automobility regime still seems relatively stable. But under the surface, cracks may be appearing that create opportunities for wider system change and transitions to sustainability" (Kemp, Geels & Dudley, 2012, p. 3). If the system is to change now, the changes must be radical and large-scale.

Urry offers "six technical-economic, policy and social transformations that in their dynamic interdependence might tip mobility into a new system" (Urry, 2004, p. 33):

- New fuel systems such as battery electric and hydrogen.
- New materials that will allow for smaller, lighter and stronger cars.
- Hybridization of vehicles with communication and entertainment technology.
- De-privatization through shared mobility (e.g. car sharing).
- Shifts in transport policy strategies from 'predict-and-provide' to 'demand reduction'.
- Hybridization of mobility itself through integration of information and communication technologies (ICT) into vehicles and other mobile products that blur the boundaries between online and offline for the user. (Urry, 2004, pp. 33-35)

These transformations can be tough of as niches in a socio-technical context. Car sharing is the transformation/niche innovation that is the focus of this thesis. Urry did not expect any of these changes to lead to a 'post-car' world in and of itself. Rather, "their interdependencies occurring in an optimal order might thus provoke the emergence of a post-car system" (Urry, 2004, p. 35).

2.2 Research gaps and questions

2.2.1 Shortcomings of the MLP/socio-technical approach

In this subsection, I will outline three criticisms of the MLP as it relates to this thesis, and then explain how these criticisms inform my methodological and analytic approach. The first two criticisms relate to both the scope of inquiry and defining the boundaries of the mobility system in question whereas the third criticism is more content oriented and relates to the analytical approach employed in this thesis.

Some of the most recent work carried out in the field of transition studies concerns context and multiplicity. Hodson et al. argue that "urban transitions are not about technological or social innovations per se, but about how multiple innovations are experimented with, combined and reconfigured in existing urban contexts and how such processes are governed" (2017, p. 1). The study of context and multiplicity reveals certain weaknesses of the MLP and opportunities for further empirical research and improvement.

Firstly, t*he MLP focuses too much on the national context* in terms of spatiality. "Case studies conducted through the MLP usually had a national focus and the spatial context for transition was often de facto national transition. In this view, spatial issues were pre-given, underplayed or ignored" (Hodson, et al., 2017, p 3). With respect to spatiality, it may seem obvious, but bears emphasizing that studies of urban mobility should focus on urban areas when deciding the bounds of the system. Although urban areas have been largely overlooked by the MLP, they are the most likely places where a mobility transition will take place (Bulkeley, Broto, Hodson & Marvin, 2011).

Furthermore, the MLP should take into consideration multiple forms of governance (which is not to say just governments) that overlap and interact – not just national ones (Hodson, et al., 2017, p. 3). We should not equate urban governance with municipal government. There is a weak correspondence between what policy makers in a city want to legislate and the characteristics of a socio-technical regime. This is why, despite the multitude of cities and forms of governance found across the world, most cities can be characterized by automobility, or are moving in a similar direction. Although the application of the MLP to urban mobility should pay more geographic attention to cities, exogenous social, political and economic forces, both top-down and bottom-up, should be given due consideration.

Secondly, t*he MLP is too singular*. "The MLP often focuses on singular transitions with one niche-innovation struggling against an incumbent regime" (Hodson et al. 2017, p 2). In the case of urban mobility, this almost never happens. There are more, often many, side-by-side innovations that are competing with, co-existing and complementing the incumbent regime and one another. A fuller understanding of transitions would take into consideration this multiplicity and study the contexts within which such multiplicity exists with the understanding that the dynamics between various innovations and visions would be different in each context.

Perhaps the most common and persistent criticism of the MLP is that *it is too top down and supply-side driven* (Southerton & Watson, 2015). Whereas the chief success of the MLP has been to give a bird's eye view of complex phenomena, its primary weakness is that it fails to capture transition related phenomena closer to and on the ground. "Attention is required to the dynamics between levels and between actors of the same level, resulting in a myriad of events, actors and relations that need to be taken into account" and this is something the MLP has not been very effective at doing (Lachman, 2013, p. 271). A more ground-level and demand driven approach to transitions could lead to a richer understanding of these dynamics.

The MLP's advantages in scope and generalizability wane as one zooms into the transition process. There, the process seems more chaotic, uncertain and in some instances, governed by chance. The innovations that do succeed often do so independently of deliberate shielding mechanisms and transition management practices (Loorbach, 2007, p. 110). When innovations seem to be outside the control of those who seek to enact a transition (pathway), it may be useful to focus on the micro processes that take place between the regime and niche, in particular the actions of actors who adopt or reject the innovations in question. This represents a gap in the research as well as an opportunity to improve the MLP and the socio-technical approach in general.

2.2.2 From research gaps to research questions

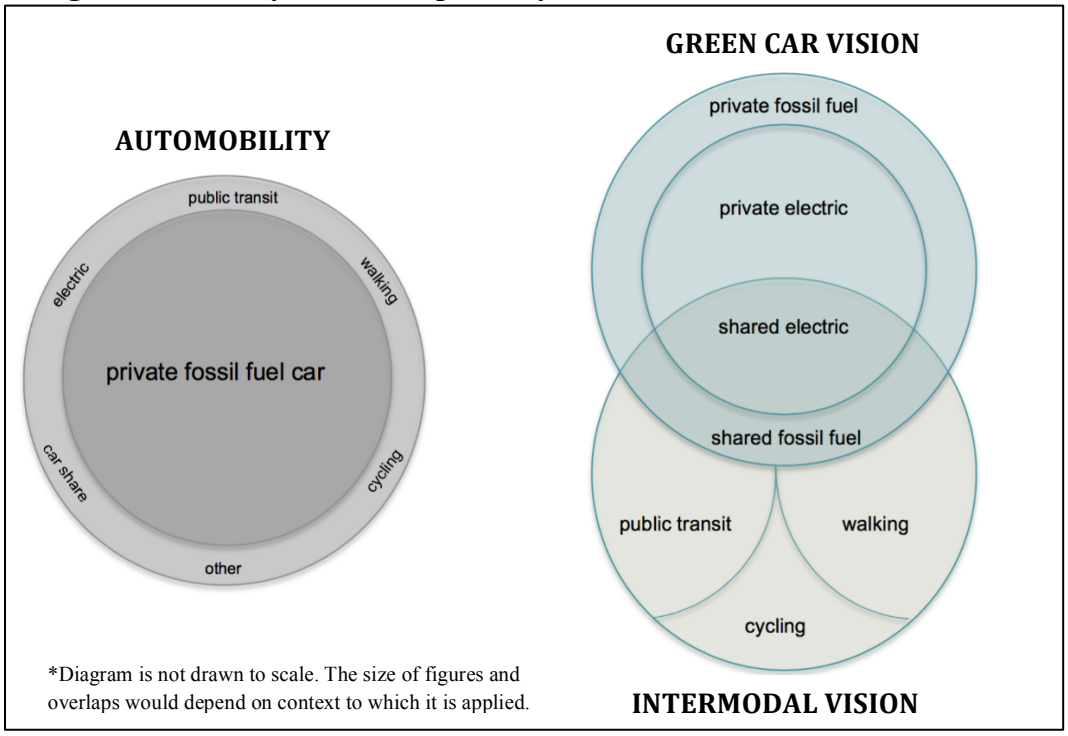
I have delimited the research topic of this thesis based on thematic weaknesses of the MLP in practice. My choice of analytic framework is based on an operational weakness of the MLP.

The first two of the aforementioned criticisms of the MLP inform the delimiting of my research topic, which focuses on Oslo as an urban context, and car sharing as an innovative form of mobility. The pathways typology can be useful for highlighting how Oslo and car

sharing address these criticisms. Earlier in the introductory section, I mentioned that Oslo is an important city because it is home to two competing visions for what the future of urban mobility will look like. I furthermore, mentioned that car sharing is uniquely compatible with these two visions. The 'green car' vision and the 'intermodal' vision that I was referring to can be viewed, respectively, as the transformation and reconfiguration pathways.

In short, Oslo is an interesting geographic context to study mobility transition because it is one of the only places in the world where multiple transition pathways are actively and simultaneously being supported/enacted by multiple actors, from multiple levels, within the system. And although car sharing can be thought of as a singular mobility innovation, it straddles the two most likely transition pathways for urban mobility systems in the coming years – those of transformation and reconfiguration. This project seeks to extend the scope of inquiry beyond the national context and beyond the singular nature of innovations. The following diagram helps illustrate the multiplicity of pathways and modalities found in Oslo, and has informed the selection of the research topic for this thesis.

Figure 1. Mobility transition pathways in Oslo



The last of the three criticisms – that the MLP is too top down – serves as the springboard for the data collection and analysis carried out in this project. This project adopts a bottom up approach, which is to say that it focuses on mobility behavior and user adoption of car sharing in Oslo. Criticism that the MLP is too top down – and that we need to give more attention to

the demand side of mobility – is all well and good. But what is so important about the demand side and the user perspective in the first place?

Without user adoption, an innovation is just an invention that will most likely be forgotten. In this regard, it is important to consider, at the outset, the difference between an invention and an innovation. Whereas as invention is the first instance of an improved product or process, an innovation is the attempt to carry it out into practice (Fagerberg, 2005, p. 5). This is to say that the significance of an innovation is intimately related to the extent to which users adopt the new product or process. Another way of thinking about it is that "consumers and practitioners are as central and vital to change as promoters and producers…innovations in practice do not materialize unless enacted by those who do" (Shove & Walker, 2010, p. 475).

The singular, national and top-down approach of the MLP can be very useful for understanding the development of a singular technology like the atomic bomb. There was no top-down, bottom-up problem with the Manhattan Project because the system actors who created the bomb were also the ones who used it. Most systems and innovations are not as clear cut. With a socio-technical system like mobility, in which the mobility practice is carried out by users/consumers, the question that is often at the back of the mind of supply-side/regulatory actors is, how to influence user behavior so that more sustainable products and processes are prevalent?

Although it is common for scholars to acknowledge the importance of users in automobility configurations (Geels, 2004), this is somewhat superficial and dismissive because the transition literature is still overwhelmingly focused on policy and corporate actors, who are important, but represent a narrow cross-section of the entire system (Shove & Walker, 2010, p. 476). Despite its shortcomings, the socio-technical perspective and the MLP continue to dominate the transition discourse. Some scholars have argued for newer approaches. Shove and Walker (2007, p. 768), for instance, call for "loosening the intellectual grip of 'innovation studies', for backing off from the nested, hierarchical multilevel model as the only model in town, and for exploring other social scientific, but also systemic theories of change". Theories of practice offer an alternative or modified understanding of systemic transition – one that I will use as an analytical framework for my research questions.

I do not propose that practice theory should supplant the MLP or the socio-technical approach, but rather supplement the MLP with detailed empirical analysis of the micro and end-use phenomena in order to improve the socio-technical approach. Practice theory may be

useful in providing systemic analysis of users within a broader socio-technical transition context. The main aim of this research project is to provide a bottom-up, user perspective of the innovation process with a focus on the adoption of car sharing. My two research questions that I use to help achieve this are:

RQ1: How does the car sharing relate to other practices for urban households in Oslo?

By other practices I mean activities engaged in at the household level that have either a direct or indirection relation to mobility. First and foremost, I will consider other forms of mobility such as private car use, walking, cycling and public transit. I will also consider auxiliary practices that are necessary for actually using car sharing, such as parking and vehicle reservation. I will also consider broader non-mobility practices in the informants' lives that may have an effect on the use of car sharing. The aim of this question is to investigate potential complementarities or points of friction that car sharing may have with these other practices. I am particularly interested in the values and cultural meaning associated with practices rather than their mere material or functional aspects.

RQ2: Why do urban households in Oslo use car sharing services?

This question is not posed with the expectation of a simple linear answer. At the surface level, we already know that users engage in car sharing in order to fulfill their mobility needs. I hope to dig deeper and investigate not just motivations, but the mechanisms of everyday life that are at play in terms of fulfilling those mobility needs. I will also consider other aspects of the informants' lives, such as their values and tastes, that may have an effect on their use of car sharing. This question keeps eventual promotion and upscaling in mind, which is to say that by understanding why users adopt new practices, it may be possible for regime actors to respond to and influence user behavior in a deliberate manner.

The questions are not intended to determine whether or not a mobility transition will take place in Oslo, let alone if car sharing will contribute to one. This project is designed with future research in mind that could address, with more scope and rigor, questions pertaining to the fate of the overall mobility system in Oslo and beyond.

2.3 What is practice theory?

A practice can be understood as:

> "a routinized type of behavior which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge." (Reckwitz, 2002, p. 249)

The MLP and practice theories have different approaches to innovation. If the MLP has a tendency to focus on a technological innovations and follow them from inception to application, practice theory approaches innovation from the other end – that of its end use and the structures that support its use. "Whereas the policy tools proposed by multilevel models of innovation often focus on the promotion and spread of technological innovations, policies informed by theories of social practice instead try to intervene in the evolving fabric of social practices in a way that helps spread sustainable practices and limit undesirable ones" (Southerton & Watson, 2015). Practice theory reorients the social part of socio-technical from large-scale social processes (supply side) to matters of everyday life (demand side) (Shove & Walker, 2010, p. 471).

This project seeks to explore whether the two approaches could mutually inform the sustainability transition discourse. My research questions are informed by the shortcomings of the MLP described earlier as well as the opportunities for informing it with a practice theory approach. Despite differences in scope, both the MLP and practice theory employ a systemic understanding of mobility, whether through the configuration of automobility components or the interrelated elements of mobility practice, the latter of which will be explained in greater detail in the next section.

It should be stated at the outset that, like the MLP, practice theory does not seek to create ontological categories. It is not a representation of the world 'as it is'. Practice theory is a heuristic tool that provides a vocabulary and a system of interpretation that serves as a framework for empirical analysis (Reckwitz, 2002, p. 257).

Practice theory is a type of social theory, which is to say that it seeks to understand human actions and social order. It does so by looking at everyday activities rather than ideal concepts such as 'the individual' or 'the market'. Practice theory can be understood by comparing it with other types of social theories and cultural variants therein.

First and foremost, practice theory is different from the classical social theories that view humans as *homo economicus* and *homo sociologicus*. According to the classical theories, human actions are either the result of: (1) individual actions, intentions and interests that inform deliberate choices; or (2) collective values and rules that shape human behavior and lead to a normative consensus (Reckwitz, 2002, p. 244).

Shove and Walker (2010) use daily showering as an example of an activity that has emerged relatively recently in human history and is not well understood by considering rational choices or values. Most people do not make a mental calculations or consider the moral implications of showering before engaging in the activity on a daily basis. Rather, they are habituated agents and daily showering is best understood as a routine. From a socio-technical transition perspective, the obvious question is, how and why did this routine start? Or how do such practices change?

Cultural variants of social theory, as opposed to the classical economic and sociological worldviews, would answer these questions by "reconstructing the symbolic structures of knowledge which enable and constrain the agents to interpret the world according to certain forms and to behave in corresponding ways" (Reckwitz, 2002, p. 245). These enabling and constraining mechanisms used in cultural theory should not be confused with mere incentives and disincentives – doing so would lead back to *homo economicus*. Practices change and persevere based on the worldviews of the practitioners, which informs how they integrate the constitutive elements of a practice.

Mobility behavior, or any routinized behavior for that matter, presupposes a particular way of understanding the world. According to proponents of cultural theory, classical social theory ignores the tacit layers of knowledge that enable social order. This is not to say that choices and values don't exist, but that this tacit knowledge reproduces social order by informing which desires are desirable and which norms are legitimate (Reckwitz, 2002, p. 246).

Such layers of knowledge and social order signify that practices have contexts. Røpke and Christensen (2012) explain how practices combine to form frameworks, at the individual level as well as the collective or societal level. Frameworks are the result of the reproduction of previous practices that creates institutions and 'path-dependent biographies' that influence, but do not determine, human behavior. When individual and collective frameworks are

combined, the result is a *project*[2], which is "a series of activities, or in the terms of practice theory, a complex of practices necessary to complete an intention…It may be seen as a sort of metapractice to which several ''sub-practices'' relate…Often a practice contributes to several *projects*" (p. 351). For example, people often attend church in order to develop a sense of spirituality as well as maintain social relations, both of which can be considered *projects*.

Practice theory is also unique in where 'the social' is situated. In other cultural theories, such as mentalism, textualism and cultural inter-subjectivism, the site of the social is in the human mind, discourse/symbols, and interaction, respectively [3]. Practice theory decenters the human agent from social analysis and focuses instead on the practice itself as the site of the social. Rather than being 'autonomous individuals' or 'normative conformists', human agents are carriers of a practice; "the individual is the unique crossing point of practices, of bodily-mental routines" (Reckwitz, 2002, p. 256). Similarly, practice theory is interested in objects, discourse and interaction, but only insofar as they are aspects of practices, not the focus of study.

3 Analytical framework

In this section I will elaborate on the elements of practice, describe how practices can change and conclude by relating practice theory to car sharing and socio-technical transitions.

3.1 Elements of Practice

When describing socio-technical systems, the MLP views technology as 'configurations that work' (Rip & Kemp, 1997, p. 330), which is to say an "alignment between a heterogeneous set of elements (that)…fulfills a function" (Geels, 2002, pp. 1257-1258). The automobility system as described by Sheller and Urry (2000) and the socio-technical configuration for transportation as described by Geels (2002, p. 1258) embody this approach.

Practice theory is similar in that it attempts to capture systemic complexity as an alignment of heterogeneous elements. It should be noted, however, that systemic functionality is not given

[2] This term will herein be italicized in the text in order to distinguish it from the 'research project' that is the basis for this thesis.

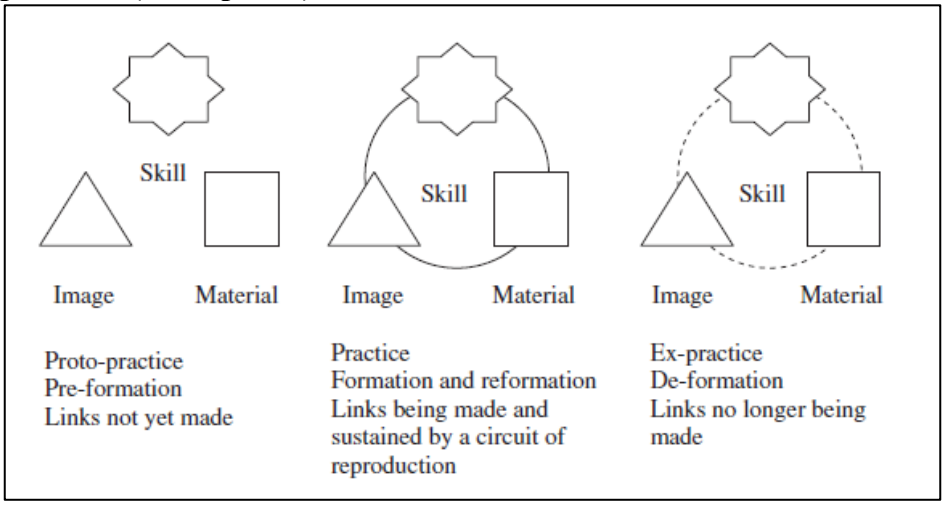
[3] I will not go into great detail regarding the development of practice theory and its cultural and social theoretical antecedents because this paper aims primarily to contribute to the literature surrounding transition studies, not social theory. Practice theory will be used as a lens through which I can analyze certain parts of the mobility system that are not covered adequately by the MLP.

the same importance as in the socio-technical approach. “Rather than treating ‘human need’ or ‘societal functions’ as given, we have asked ourselves how variously sustainable practices come into existence, how they disappear and how interventions of various forms may be implicated in these dynamics.” (Shove & Walker, 2010, p. 476). ‘Things’ are often used for something, but this functionality does not define the practice being analyzed.

Just as with socio-technical configurations, the elements of practice are interconnected and form something that is greater than the sum of their parts (Reckwitz, 2002, p. 250). This project seeks to analyze user adoption and mobility behavior through such a lens of the interconnected elements.

There is no consensus regarding the constitutive elements of a practice and the application of practice theory to mobility has been limited. Pantzar and Shove use practice theory to discuss the rise of Nordic walking, “a form of speed walking with two sticks” (2010, p.447) starting in the late 1990s. Working with an understanding of practices as being constituted by interconnected elements, the authors analyze the emergence, reproduction and disillusion of practices based on generic phenomena in the innovation process with respect to user behavior. The constitutive elements of a practice are: (1) things or materials; (2) bodily knowledge, competence or skill; and (3) mental activities, symbolic meaning and image. Innovation is the result of the formation and breaking of links between these elements (p. 451).

Figure 2: Pantzar and Shove’s constitutive elements of proto-practices, practices and ex-practices (2010, p. 450)



Practices have a history – Nordic walking, for example, is a modern form of exercise that is a variation of something that predates our existence as a species. Practices “represent novel

combinations of existing elements (and)…come into existence, persist and disappear when connections between foundational elements like those of material, image and skill are made, sustained or broken" (Pantzar and Shove, 2010, p. 450).

We should, however, resist the temptation to view the elements of practice as existing 'out there in the world', which would reduce practices to being the sum of static phenomena. "Practices and elements are maintained and fractured through identifiable 'circuits of reproduction', a term we use to describe processes of enactment which simultaneously limit or facilitate the transformation of the practice in question, its integration with other practices and the reproduction of elements" (Pantzar and Shove, 2010, p. 450).

In the example of Nordic walking, the materiality of the practice is associated mostly with the walking sticks, or that which distinguishes Nordic walking from regular walking. The skills and forms of competence, while seemingly simple, cannot be dismissed. Much of our ability to walk is hard-wired into our bipedal biological makeup, but there are techniques to using walking sticks effectively. The symbolic meaning and imagery connected to Nordic walking varies. On the one hand, many feel that it looks unconventional or silly. On the other, there has been an association with health, nature, well-being and socializing. Pantzar and Shove's analysis of Nordic walking yielded five critical insights (*2010*, p. 456-7), which will be applied to and compared with car sharing later on in this thesis.

- Innovation in practice requires that these elements must already exist prior to the emergence of the practice (i.e. proto-practice).
- The elements must be integrated in order to form a cohesive practice. Users, or practitioners are the most influential in making and breaking these integrative links.
- Innovation in practice is a 'collective accomplishment'. Although performed by individuals, practices exist in social contexts.
- Promoting a practice is very different that actually engaging in it. Top-down actors cannot integrate elements through marketing alone.
- Relations between promoters and practitioners co-evolve. User adoption and behavior affects how promoters' actions, expectations and goals.

In some respects, Nordic walking was chosen as a case for illustrating practice theory because it is a relatively simple practice. The Nordic walking stick, for example, is a singular innovation that was created and promoted by a single company in one country (Pantzar and

Shove, 2010, p. 453). Car sharing, as part of a broader urban mobility system, is much more complicated and would serve to test the bounds of practice theory as a tool for understanding mobility transitions.

3.2 How practices change

Through an analysis of the gradual accumulation of innovation and its transformative effects on the practice of cycling, Watson (2012) identified three mechanisms by which practices can change. In short: (1) the material elements that constitute the practice can change; (2) the practitioners can change; and (3) the relationship between various practices can change.

The most obvious way in which elements of a practice can change is through technological innovation. The creation of the bicycle and car were necessary for people to be able to ride them. Skills and meanings can change as well. "For example the rise of the cycle courier in major western cities in the later 20th century involved no radical technological breakthroughs, but the distinctive performances of cycling by couriers shifted the meanings of cycling, passing through into styles of clothing, cycles and bags used by other urban cyclists seeking to emulate a messenger aesthetic" (Watson, 2012, p. 4).

Secondly, changes in the actual practitioners are also important. This may seem confusing at first considering that practice theory treats the practice as the primary unit of analysis and downplays the importance of individual attitudes, beliefs and choices. It should now, however, compel the researcher to completely ignore the practitioners or their experience. Kent and Dowling (2013, p. 89) look to 'trigger' events, which take place well after the individual is first exposed to the new practice. In the example of car sharing, the authors cite unexpected events, such as a car breakdown or sudden change in employment situation as instances that compelled individuals to practice car sharing for the first time.

Thirdly, a practice can change as a result of changes in its relationships with other practices. This relationship can be characterized as either bundles or complexes. The relationship between grocery shopping and personal mobility are considered bundled practices. In many contexts, retail locations co-evolved with changes in personal mobility – the rise of automobility, for example – resulting in large out-of-town supermarkets that are typically frequented once a week. This in turn reinforced the practice of personal automobility, which was then needed to shop at locations not accessible by walking, bicycling and public transit

(Watson, 2012, p. 5). The co-evolutionary relationship of bundled practices eschews the question of chicken or egg.

There are, however, relationships that are more 'tightly integrated' whereby one is considered necessary for the other to succeed. These relationships are described as complexes of practices. The example of automobile maintenance is provided as a practice that had to be outsourced to skilled and readily available professionals in order for the practice of driving to change from a leisure activity for the wealthy and adventurous to the dominant form of personal mobility for the masses (Watson, 2012, p. 5). The relationship between practices in a complex is typically functional – the practices depend on one another in order to be enacted. It should be noted that the 'projects' described by Røpke & Christensen (2012) are indeed complex of practices, but they additionally require the combination of frameworks and involve intention. Nevertheless, changes in one practice can influence other practices that are related through bundles, complexes and projects.

The conceptualizations of practices coming in bundles and complexes may help address the MLP's weakness in accommodating a multiplicity of innovations and pathways. Bundles and complexes have to potential to capture not only multiple innovations within a context but also incumbent practices that were already part of the regime. By using practice theory, we can investigate how car sharing relates to other mobility options and auxiliary practices that may have an effect on mobility.

It should be noted that the elements are 'integrated', to form a practice, by practitioners – this may involve incentives, coercion or personal tastes, but in the end, the act of integrated is carried out by practitioners. According to Shove and Pantzar (2007), when practices change, it involves the 'recruitment' of practitioners, which often implies 'defection' from another practice. Not all practices are zero-sum but when applying practice theory to automobility, changes in mobility behavior would involve recruitment to one practice and corresponding defection from competing mobility practices. When a practitioner continues to practice the practice and it grows, this is referred to as reproduction of the practice through 'retention' of the practitioner. In order for car sharing to have a meaningful impact on the mobility system, it would have to recruit enough users, especially defectors from private automobile use, and retain them so as to reproduce the practice of car sharing until it is able to sustain itself.

3.3 Practice theory and car sharing

Kent and Dowling's (2013) analysis of car sharing through the lens of practice theory, carried out in Sidney, Australia, uses the three elements described by Pantzar and Shove (2010) as well as the three mechanisms of change described by Watson. There are many insights from this study that are relevant for my thesis.

With regard to materiality, car sharing is more likely to succeed in areas where the mobility infrastructure is conducive to walking, biking and public transportation. This is why car sharing services are typically found in dense mixed-use areas that are not as dependent on private automobiles as their suburban and rural counterparts. Car sharing also builds upon existing technologies – by maintaining the same vehicle and infrastructure, users are not required to learn how to use new objects from scratch.

This applies to the skills element as well because it's reasonable to assume that car sharing users already know how to drive. And furthermore, much of the skills needed to gain membership and book cars online are similar to other online experiences. Car sharing relies on transferable skills that are already with the users. This may pose challenges with some users, particularly older ones, and we can expect that the baseline skill set of potential users will change over time.

Perhaps most importantly, the meanings associated with car sharing, driving and mobility have changed. "Cars, especially for young people, are losing their grip on identity formation as underpinning progress, freedom, youthfulness and absolute autonomy" (Dowling & Simpson, 2013, p. 422). This may aid the transition towards a system of mobility in which each individual user does not feel the compulsion to own their own meaning-laden object.

The changes in meaning may also reflect or overlap with changes in the actual users. The use of car sharing services "may be preceded by an underlying dissatisfaction with the private car, the source of which may have been building through years of sitting in traffic jams and paying for car repairs" (Dowling & Simpson, 2013, p. 89-90).

And finally, car sharing, like any other practice, does not exist in isolation. Car sharing's ability to endure over time will rely on its ability to integrate itself within other practices, which may or may not be directly related to mobility. This may require new practices, such as time management and planning – car sharing, more often than not, presupposes a fixed

period of time rather than an open-ended range of possibilities. This means, for example, that a visit to a family member or friend would have to take into consideration the period of availability for which the car has been booked, or vice versa.

3.4 Practice theory and socio-technical transition

Recognizing some of the weaknesses of the socio-technical approach, this thesis seeks to analyze mobility from the ground up. As mentioned earlier, I do not seek to replace the MLP, but rather inform it with a relatively novel approach and in-depth insight into user adoption of innovations and mobility behavior.

In particular, I investigate if and how shifts in elements of practice (materials, skills and meaning), users, and the relationship between practices can inform existing descriptions and explanations of how niche innovations become part of the regime. The current sequential framework of niche-regime integration (i.e. novelty, development, breakthrough and replacement) and pathways typology are effective at capturing macro perspectives and top-down phenomena regarding singular innovation in national contexts. The user perspective and multiplicity, however, are absolutely necessary for understanding the mobility system and are not well-served by the MLP as it is used today.

My use of practice theory seeks to highlight the user adoption of car sharing and mobility behavior, as well the multiplicity of the innovation process in terms of how car sharing relates to other mobility innovations on the ground as well as characteristics of the incumbent regime. A richer demand-side understanding of mobility innovations would be of interest especially to supply-side and regulatory actors interested in being able to impact the broader socio-technical system within which the innovation exists.

Table 1. Summary of analytical framework

Constitutive elements	Mechanisms of change
materials: 'things' or technological product	**Δ material element:** technological innovation, new capability or functionality
skills: bodily knowledge, competence or skill required to engage in the practice	**Δ practitioner:** trigger events, life events, life stages
meanings: mental activities, symbolic meaning and image	**Δ related** practice: bundles, complex and projects

4 Methodology

In the following section, I will describe the methodology used to collect and analyze the empirical data used in this project. Firstly, I will review the qualitative research approach and argue how it can help answer my research questions. Secondly, I will elaborate on the use of household interviews and the processes of data collection and analysis. I will conclude by addressing the issues of reliability and validity, reflexivity and positionality, and research ethics.

4.1 The qualitative approach

The decision to use a qualitative approach was made based on the nature of my research topic and questions. One of the fundamental goals of qualitative research is to understand individuals' experiences of places and events (Winchester & Rofe in Hay, 2010) or as Corbin and Strauss (1990, p. 19) stated, "Some areas of study naturally lend themselves more to qualitative types of research, for instance, research that attempts to uncover the nature of a person's experiences with a phenomenon". At its core, the questions posed by this project aim to understand mobility behavior within a particular context (Oslo) and the manner in which the two may influence one another. Having recognized the weakness of the socio-technical literature in addressing micro-phenomena and user perspectives in the transition process, I decided to delve into these experiences and phenomena using qualitative in-depth interviews.

It is important here to reflect on the difference between intensive and extensive research. Extensive research seeks to establish statistical relations of similarity and difference based on 'the identification of regularities, patterns and distinguishing features of a population', whereas intensive research seek to understand *how* processes work by investigating human behavior, its causes as well as its contexts (Bradshaw & Stratford, in Hay 2000, p. 39-40). Although the study of car sharing practices in Oslo could potentially benefit from both research approaches, the intensive (i.e. qualitative) approach is more conducive to in-depth nature of the research questions posed in this thesis.

This project's focus on user adoption of innovations and everyday mobility behavior is very much geared towards questions of 'how' and 'why' as embodied by the qualitative approach. Miles and Huberman (1994, p. 10) state that qualitative methods are useful because they: "focus on *naturally occurring, ordinary events in natural settings*, so that we have a strong

handle on what "real life" is like"; yield rich and holistic data with strong potential for revealing complexity; are inherently flexible; and are fundamentally well-suited for locating the *meanings* people place on the events, processes and structures of their lives".

Car sharing is an emerging mobility practice that does not have a significant body of empirical research around it. The same can be said for the incorporation of user perspectives and in-depth analysis of micro-phenomena within the socio-technical literature. As such this project is partly exploratory in that it does not seek to provide final or conclusive solutions regarding the sustainability of urban mobility or the theoretical understanding of socio-technical transitions. Exploratory research can "help in determining the research design, sampling methodology and data collection method. In some cases, exploratory research serves as the formative research to test concepts before they are put into practice" (Singh, 2007, p. 64). The data used in this project were collected and analyzed with subsequent and more conclusive research in mind[4].

Although this project is partly exploratory, it does employs formal in-depth interviews with due consideration for rigor, validity and reliability, and seeks to identify implications, both theoretically in terms of future research, and practically in terms of policy and regulatory approaches to innovation in urban mobility.

4.2 Data collection

Purposeful Sampling

In-depth interviews were conducted with seven households living within the municipal bounds of Oslo. All but one of the households lived in the urban core (within Ring 2) – one family recently relocated from the urban core to the municipal periphery. All but one of the households had at least one young child (under four years of age) – one household had a teenager. I focused on families with young children living in urban areas because their residential situations close to the time of childbirth run somewhat counter to the conventional narrative of outward (suburban) residential mobility and automobile-dependence (Lanzendorf,

[4] This project was carried out in collaboration with a multi-year international project entitled "Transforming household mobility practices through shared consumption: Low-carbon transport and sustainable energy solutions in urban areas (TEMPEST) funded by the Research Council of Norway and managed by the Institute of Transport Economics (TØI) in Oslo. The data and analysis in this thesis are being used to inform research that will be carried out by the TEMPEST project over the course of the coming year.

2010; Michielin, Mulder & Zorlu, 2008; Winstanley, Thorns & Perkins, 2002; Kulu & Boyle, 2007). Given that childbirth and family life are associated with private automobile use and the suburbs, we wanted to find out why some households decided to stay and use car sharing instead.

Of the seven households interviewed, four were active users of car sharing. One household consisted of former users who were actively considering resuming the use of car sharing. Two households were prospective users that were actively considering car sharing as an alternative. The decision to choose both active user and prospective users was made with my research question and analytical framework in mind. Given that I was investigating why households engaged in the practice of car sharing and used mechanisms of change (of practices) as part of my analytical framework, I wanted to ensure that I had perspectives and experiences of households that we not yet users, but were actively considering it.

Table 2. Overview of households interviewed

Household	Informants	Date	Duration (min)	Neighborhood	No. members in household	Car sharing user?	Car owner?
1	1A 1B	01.11.2016	94	Grünerløkka	4	yes	no
2	2A 2B	03.11.2016	93	Grünerløkka	3	no	yes
3	3A 3B	14.11.2016	66	Gamle Oslo	4	yes	no
4	4A 4B	15.11.2016	100	Grünerløkka	3	no	yes
5	5A	09.01.2017	44	Grünerløkka	2	yes	no
6	6A 6B	30.01.2017	119	Grünerløkka	3	yes/no*	no**
7	7A 7B	27.03.2017	121	Østensjø	4	yes	no**

* Former user.

** Have decided to lease a car.

Recruitment

The informants were recruited using my personal networks at a local kindergarten. Four of the seven households have children that attend the kindergarten. One household is headed by a colleague of the researchers on the TEMPEST project team. The remaining households were recruited using snowball sampling.

Interviews

The interviews took place between autumn 2016 and spring 2017. All but one of the interviews were conducted in the evening at the homes of the households – on interview was held over lunch at the informant's office building. The average duration of the interviews was approximately 90 minutes. For four of the interviews, I was joined by a researcher from the TEMPEST project team. With the exception of one single parent household, the interviews were conducted with both parents present; in one instance, one parent was unable to participate for the entire interview owing to an unwell child in the other room. Prior to the start of each interview, household member(s) were asked to fill out a one-page questionnaire asking for household demographic and geographic information, e.g. distance to mass transit and closest grocery stores.

An interview guide was prepared and used for all interviews. The ordering of questions followed a pyramid structure (Dunn in Hay, 2010, p. 108) whereby easier 'icebreaker' questions were followed up by more general and abstract ones. The interviews were, however, conducted in an open-ended manner that allowed each informant to give detailed descriptions and explanations in a flexible manner.

Good interviews generally have a mix of question types to account for the different types of responses that informants will invariably have (Dunn in Hay, 2010 p. 106). Due care was taken to include a variety of questions having to do with informants' experience (including sensory)/behavior, opinions/values, feelings, and knowledge. Questions were asked multiple times, and included primary as well as secondary questions so as to (1) further develop responses already given; and (2) check for consistency in responses. I also provided regular summaries so as to elicit confirmations and/or clarifications or responses. The interview questions were retrospective as well as prospective in nature. Retrospective questions were limited to the preceding 3 years, focusing on key life events (childbirth in particular) and changes in mobility behavior. Prospective questions were geared towards informants' expectations regarding mobility behavior in the near and long-term future.

Each interview began with an introduction to the project and a disclaimer that it was in no way endorsing the use of car sharing, or discouraging the use of private automobiles. I wanted to make clear that my priority as a researcher was to understand car sharing rather than to promote it. I followed this by asking the informants to describe their mobility behavior for a

typical day. Distinctions were made between commuting, other routine behavior, and short and long-term leisure activities. This was followed by focusing on informants' everyday use of car sharing or consideration thereof. Given that use of practice theory as an analytical framework, I was interested in not only the informants' decision-making process, but also *how* they used (or didn't use) car sharing and how it becomes a routine behavior. Informants were also questioned about their feelings on and relationship with urban life, environmental sustainability, and sharing in general.

Toward the end of the interview, each household was asked to complete a mobility biography sheet covering the preceding three years. In terms of positioning the biography in the interview guide, I wanted to ensure that the informants had ample time to think about and verbalize their thoughts before asking them to put them down on paper. In order to assist with this task, I demonstrated the filling in of the biography based on my own mobility behavior. When possible, I encouraged both adult members of the household to participate in the filling out of the form. Field notes were taken during and after each of the interviews.

4.3 Data analysis

In order to aid in my analysis of the text, I developed and used my own coding system, inspired by grounded theory, for use with the analytical framework. Grounded theory is an inductive research methodology that generates theory from data in an emergent manner (Glaser & Strauss, 1967). At its core "grounded theory is simply the discovery of emerging patterns in data" (Glaser in Walsh et al., 2015, p. 593). Grounded theory focuses on changes in human behavior at the micro level and the conditions for this change, but (like practice theory), it is not concerned with whether actors' responses are rational or not (Corbin & Strauss, 1990, p. 419). Grounded theory is useful because searching for patterns prior to applying the analytical framework helps the researcher avoid "plastering a ready-made explanation on phenomena that could be construed in more interesting ways" (Miles & Huberman, 1994, p. 38). Although the more comprehensive versions of grounded theory incorporate the entire research processes, from formulation to conclusion, my use of grounded theory is limited to the analysis of interview transcripts.

All interview recordings were transcribed within days of being held and then uploaded onto a spreadsheet (Microsoft Excel). In total, there were approximately 3,000 rows of text, with 2,000 of them corresponding to statement by the informants. The remaining 1,000 rows of

text corresponded to statements made by me or the other researcher, or time markers which were placed in the spreadsheet at 10-minute intervals. There was a great deal of variation in the duration of statements (i.e. size/height of rows). For example, some were short one-word responses – "Yes" or "OK" – whereas others were much longer, with some individual informant statements lasting for minutes.

I began the more formal stage of analysis by listening to the interview recordings while simultaneously reading through the transcripts in order to unravel prominent and/or recurrent concepts and themes related to actual mobility behavior. Each of these themes or concepts was tagged with a unique code. I included, for example, codes for all mentions of other forms of mobility (than car sharing or driving a private car), such as walking, bicycling, and taking public transit. I then categorized these codes into broader themes and concepts – in the preceding example, 'other forms of mobility' would be the broader category. Examples of important categories that I identified include 'child safety seat' 'parking' 'maintenance' 'independence' 'safety' and 'environment'. These categories were then sorted into broader categories that were derived from my analytical framework.

It was at the sorting stage that my methodological approach deviated significantly from grounded theory in that I applied a pre-existing theoretical framework to the inductively derived concepts and categories. Given the limitations of time and page length, I wanted to choose an existing theoretical framework with which to analyze my data. Nevertheless, I felt it useful to inform my practice theory analysis with concepts and categories derived inductively based on the grounded theory approach.

Next to the columns dedicated to the transcribed text and its descriptive elements (interview number, line number, speaker), I included five columns referring to elements of practice and mechanisms of change. In practice theory, there are three elements (materials, skills and meanings) and three mechanisms (respective changes in the material elements, the practitioner, and related practices). For the sake of efficiency, I included 'changes in the material elements' under the general column for material elements, resulting in a total of five general columns corresponding to the analytical framework: (1) material elements; (2) skills elements; (3) meaning elements (4) changes in the practitioner; and (5) changes in related practices.

Given that the codes, concepts and categories were derived inductively, there was a significant amount of data that did not fit well with any of the five practice theory categories. I added an additional sixth column for such data, prominent examples of which included 'induced demand' and 'sunk costs'. Although this column was not totally ignored during the final analysis and discussion, given the scope of this thesis, they were given less importance than the data that was more directly applicable to practice theory.

Beside these six columns, I added a final column in which I took running notes throughout the entire coding and analysis process. With the resulting spreadsheet, I was able to organize the data and extract meaningful observations and insights linking car sharing user behavior and the literature that contextualizes this project.

I should stress that I did not adhere to a strict version of grounded theory. For example, this project did not seek to create or test theories based on the data being analyzed, and did not explicitly take grounded theory into consideration during research formulation and interview sampling. My use of grounded theory was warranted insofar as it helped me to generate useful codes and categories to apply to the practice theory framework. It is, furthermore, consistent with the not uncommon tendency to "view grounded theory as a set of principles and practices, not as prescriptions or packages" (Charmaz, 2006, p. 9).

4.4 Reliability and validity

Questions concerning reliability and validity are rooted in quantitative and positivist approaches to research – their use in qualitative research requires adaptation (Golafshani, 2003, p. 597). Rather than ensuring that the data is 'truthful' and yields reproducible results, reliability and validity in qualitative research refers to the consistency (Punch, 2005, p. 95), dependability (Lincoln & Guba, 1985, p. 300), trustworthiness (Seale, 1999, p. 468), and rigor (Davies & Dodd, 2002, p. 281). Stenbacka (2001) argues that the qualitative approach should avoid the words reliability and validity altogether and develop its own terminology.

Despite the somewhat diffuse discourse on reliability and validity in qualitative methods, I made it a point to ensure that my research was internally consistent and that the data, analysis and findings were applicable and meaningful to my research questions. To aid this, I maintained a strong sense of critical reflexivity and kept detailed notes throughout the project, developed a comprehensive coding system for analysis, and formulated rigorous interview

questions to elicit rich responses from multiple angles. Some of these efforts were already described in the data collection and analysis sub-sections. Reflexivity and positionality will be addressed in the next sub-section.

4.5 Reflexivity and Positionality

Another critical component of my research methodology was a consistent effort to be critically reflexive. "Reflexivity is self-critical sympathetic introspection and the self-conscious analytical scrutiny of the self as researcher" (England, 1994, p. 83) that as a researcher, I examine my positionality with respect to my research environment. Positionality refers to the fact that:

> "a researcher's social, cultural and subject positions (and other psychological processes) affect: the questions they ask; how they frame them…their relations with those they research in the field or through interviews; interpretations they place on empirical evidence; access to data, institutions and outlets for research dissemination; and the likelihood that they will be listened to and heard" (Gregory, Johnston, Pratt, Watts & Whatmore, 2009, p. 556).

There were multiple ways in which my social and cultural position may have affected the manner in which I carried out the research described in this thesis. Although there were no significant imbalances of power between myself and the informants, the nature of our relationship was not irrelevant. First and perhaps foremost, I was well acquainted with almost all of the informants prior to their participation in the project. Because many of the informants have children that attend the same kindergarten as my own child, and because many of us are neighbors, I have, on several occasions, attended social gathering, both formal and informal, with the informants. With some of them, it would not be unreasonable to say that we are friends.

On the one hand, this may have been an asset, in terms of data reliability, because there was a level of rapport and trust between researcher and informants from the outset. Furthermore, because we already had background knowledge about one another through everyday encounters, there was less need to contextualize statements. For example, when an informant tells me that they must drop their child off at kindergarten and walk to work, I already know where the kindergarten and their workplace are. This allowed us to have much richer and

detailed discussions by avoiding many of the small details that I was able to take into consideration on my own.

On the other hand, my personal relationship with the informants may have contributed to reservations on their part; knowing that they would have to interact with me after the interview, informants may have withheld certain information that they would have told another researcher, whom they would, presumably, never have to see again. Although I ensured that all informants would be able to maintain anonymity, this was impossible with respect to one very important person – myself as the researcher. However, most, if not all, of the informants considered mobility to be a rather mundane aspect of their everyday activities and expressed no hesitation in speaking freely about the subject.

Another key aspect of positionality is personal bias. Unlike quantitative approaches that seek to present the researcher as completely neutral and objective by attempting to eliminate all known biases, I understand that it would be impossible for me to conduct research absent of any bias. The more fruitful approach is to recognize our biases and how they may impact our relationship with the research participants and environment (Bourke, 2014, p. 1). I recognized early in the project formulation period that I was a critic of the automobility system and that I favor a mobility transition that involved less prominence for the automobile. Keeping this in mind throughout the research project functioned as a sort of ever-present devil's advocate whenever I had to make a research decision. For example, I was explicitly aware that my targeted sampling (of families with young children living in central Oslo) ran the risk of 'cherry picking' informants who could validate my preferred vision for what urban mobility should look like. In order to counter any potential bias in sampling, I adapted mid-way through the project.

Although I had initially planned to interview only six households living in the urban core, I decided to recruit an additional one (HH7), which had just relocated to the municipal periphery. This expansion of the informant pool was driven by a desire to have at least one contrasting residential perspective as compared with the first six households. I was also careful to avoid generalizations and causal links to mobility users other than the sampled population. I furthermore emphasized, to myself and in the thesis text, that this project represents a narrow (but still useful) snapshot into much larger and more complex mobility-related phenomena.

4.6 Ethics

All informants were provided an informed consent form indicating that the interview would be recorded and transcribed, and that all information would be kept anonymous. Informants were notified that they would be able to withdraw from participation at any point during or after the interview. Interview recordings were stored on my personal computer and nowhere else. Transcripts were shared (with permission) with the TEMPEST project team with all personal information removed. Although the interviews covered a range of mobility behavior and personal information, the need to share sensitive personal information did not arise. This is not to suggest that mobility behavior has zero association with sensitive information – merely that it did not come up.

Throughout the interviews, I did my best to steer conversation away from seemingly judgmental exchanges, without losing the substantive content of informants' statements. If, for example, an informant felt inadequate because (s)he could not afford to own a car, or felt guilty for driving a diesel-driven car, or felt ashamed for not having a driver's license, I wanted to record that sentiment, but at the same time reassure them that they were not being judged for it. The initial disclaimer that the primary aim of the project was research rather than promotion was a particularly useful message to repeat.

Furthermore, in the few instances in which informants spoke about having violated a law or regulation having to do with mobility, I gave extra care to assure them that this information would be kept anonymous.

5 Results and analysis

In this section I will present the empirical findings using prominent themes from the interviews that relate to practice theory as an analytical framework. The findings will be organized into two broad categories: elements of practice (materials, skills and meanings) and mechanisms of change (changes in practitioners and changes in the relationship between practices). In the latter category, I have decided to exclude changes in material elements because they can be adequately addressed in the first category.

When describing elements of practice, I will cover both the elements that constitute car sharing as a practice as well as some of the elements of driving a privately owned automobile

that are absent from, and thereby relevant to, car sharing. By comparing and contrasting car sharing with private ownership in this way, I am looking for mechanisms of change from the incumbent practice. Furthermore, when analyzing these interviews against a backdrop of mobility transitions, it helps to keep in mind the regime that is undergoing the changes, namely, automobility.

5.1 Elements of car sharing as a practice

5.1.1 Materiality

The material elements of car sharing that I will focus on are: (1) the car itself; (2) cargo and child seats; (3) the material environment, in particular, local geography, spatial proximities and weather; and (4) the digital interface for booking and communication.

The car

The most obvious material element associated with the practice of car sharing is the car itself. The material presence of a car is something that must be taken into consideration at all times, even when it is not actively in use. Unlike Nordic walking sticks, which can be folded up and tucked away after use, a car must have ample space – actual real estate – that can be used to contain it in between uses. This is not to mention the physical infrastructure that is required in order to facilitate actual use. Put simply, cars take up space – and in urban areas, such space is limited and expensive.

For all intents and purposes, car sharing removes the physical presence of the car when the practitioner is not actively using it. Although infrastructure and parking are required in order for car sharing to work, its materiality is not as pervasive a presence for practitioners. I will discuss informant responses regarding vehicle operation and parking in greater detail in the sub-sections concerning skills and related practices.

Informants also stated that the physical comfort of the car was important to them. Informant 6B, a former car sharing user and former owner of multiple luxury vehicles, stated that the choice of cars available through Bilkollektivet was poor as compared with his options through a rental car agency or private ownership. Informant 4B, a potential user, on the other hand, compared car, in general, with other modes of transportation. He stated that the ‘bumpy and

cozy' nature of riding in the car was appealing to his three-year-old child. The comfort factor of shared cars is relevant even for those that own a private vehicle. As informant 2B stated:

> "I really like a really nice car…It's a luxury feeling for me…my car now is so teared down and dusty that we actually rent cars every now and then even though we have a car."

It should be noted that the importance of physical comfort is not exclusive to car sharing – it is equally applicable to the use and ownership of private vehicles.

Cargo

Cars take up space, but they also provide space – for things. A common thread throughout the interviews was that car sharing was used in order to transport cargo, and in some cases, to store it. As per the interviews, the material importance of cargo manifested in two main ways. Firstly, shared cars were used to transport goods to and from areas that were located outside of (convenient) public transport coverage. This typically involved shopping at a specialty store outside of the city center or spending a weekend at a cabin or with relatives. Secondly, shared cars were used in order to transport goods, the size or quantity of which are too large for public transit or active transit – for example, bringing home heavy boxes from Ikea or helping a friend move large furniture into a new apartment.

Although all of the households interviewed indicated that cargo was a factor, those that expressed the strongest feelings about it were not active car sharing users – one consisted of potential users (HH2) who own a private car, and the other consisted of former car sharing users (HH6) who were in between leases. Comments about cargo were not limited to capacity, but also the duration of their presence in the vehicle. When explaining their reasons for owning a car, HH6 mentioned the following:

> Informant 6A: We found it very easy just to have a car that we could just put everything in…this thing of coming back late in the evenings, as we often do when we are away for the weekend. We can now just leave the car
>
> Informant 6B: With all the luggage in it.
>
> Informant 6A: And get everything done the next day…
>
> Informant 6B: And I think that's partially due to what kind of use we have for the car,

> because it's not so much, run that small errand during the middle of the week. It's mostly weekend trips and it's mostly trips that we take more stuff with us and we also bring more stuff back. So it's more like a luggage helper.

Car sharing requires that all cargo and personal articles be removed from the vehicle prior to returning it.

Perhaps the most important type of cargo, as it relates to the sample pool in this project, is the car seat for children. Since all but one of the households interviewed had small children, the legal requirement to use car seats affected nearly every informant's use, or potential use, of car sharing. Across the board, informants reported frustration with having to install and uninstall car seats before and after use. Informant 1B stated:

> Yeah, it's the car seat thing…and also, a bit of stress with when you're finished doing what you want and then one has to drop off here with the kids, the other has to bring the car back and what to do with the car seats…it takes like half an hour to get the car prepped…And it's heavy.

As a non-negotiable aspect of driving with small children, car seats represent a necessary material element of car sharing for certain populations. As the interviews indicate, however, it is not a barrier that cannot be overcome.

Material environment

The significance of materiality also extends to the physical environment. By this I do not mean pollution and climate change, but rather, local geography, spatial proximities and weather, which are not only elements of the practice of car sharing but all mobility related practices. Many of the households indicated that material environmental factors were important in determining household activities and transportation modes. In general, cars were reported to be a more reliable and comfortable way to travel when confronted with material environmental challenges such as inclement weather or steep hills.

Informant 2B indicated that although he had a positive opinion of biking, he drives to work because of the hilly topography in Oslo. When talking about his daily commute, he stated:

> "Biking – I would absolutely never do that because it's higher in terrain. It's on top of Nydalen, so it's an uphill ride from here and I'm absolutely too lazy to do that in the morning."

The same informant echoed this preference for driving when talking about the household's previous apartment, located in a hilly part of the city: "We lived in a really weird spot – really high terrain…Every time she (Informant 2A) biked home, it was kind of a mess. So it was pretty nice to have a car." Topography is also relevant to the relationship between car sharing and other practices, especially biking.

Spatial proximity is a crucial element of mobility practice. It should be noted here that almost all of the households interviewed rely heavily on walking, biking and public transit for commuting and daily household activities. This is only possible in areas where the destinations and intermediary locations are close by. For example, all of the households conduct grocery shopping in their local neighborhood stores. Also, all of the households live within walking distance of public transit. Car sharing (and cars in general) simply isn't necessary on a daily basis when everything is so close at hand. In a more spatially dispersed residential and commercial environment, it would make more sense to drive on a regular basis. The households primarily used car sharing for leisure activities and longer trips (both in terms of distance and time) that cannot be taken comfortably by other modes.

Spatial proximity is also an important factor when considering how far the user must go in order to pick up and drop off the car. All of the user households that resided in the central part of the city reported satisfaction with the availability of cars in their immediate environment. The one household (HH7) that recently relocated from the center to the municipal periphery reported that their change in residency has made car sharing more difficult due to a decrease in cars available in their area:

> "because we have moved so far from the nearest pool, it's not that practical as it was when I was in Grünerløkka. In Grünerløkka I had a pool just 2 minutes away and another 3 or 4 pools 5-10 minutes away. It was always that if that pool was empty, I could look at the next pool then." (Informant 7B)[5]

[5] A 'pool' is the term used by Hertz Bilpool to denote a cluster of shared cars, typically between four and seven vehicles, parked at a fixed location.

This household has decided that they will soon stop using car sharing and begin leasing a vehicle. Spatial proximity was one among several reasons given.

The material element of car sharing also includes weather, particularly low temperatures and precipitation. Informant 5A described how weather played an important role in her decision to use car sharing. When describing an incident in which her son was waiting for a tram after a football practice, she stated:

> "it was like 30 minutes wait and he was standing there and it was so cold…he was 9 (years old) and I was like 'my poor kid' and I was like 'I'm going to have a car again'… I saw that he was freezing…I saw my baby freezing."

Weather had a disproportionate effect on mobility behavior depending on mode. As pedestrians and cyclists were the most directly exposed to weather, they were also the ones who reported the most variability in mobility behavior – some informants stated that they tend to avoid biking and walking when it is either raining or too cold. Although driving is certainly affected by weather, none of the informants reported changing or cancelling plans using shared cars as a result of transportation difficulties related to weather.

Interface

It has been stated many times in this thesis that car sharing is not just a technological innovation but a social one as well. There are, however, clear instances that illustrate the technological innovations that have made modern car sharing possible, namely, the smartphone interface. Smartphones have become an integral component of many forms of mobility system (Goldwyn, 2014) and it can be considered a significant material element of car sharing as a mobility practice. From an innovation perspective, smartphone technology and car sharing exhibit a relationship that is complementary.

Before the advent of the smartphone, most car sharing services offered a more manual booking system that involved visiting a brick-and-mortar office, signing paperwork and picking up and dropping off keys. Most modern formal car sharing services, including the ones used by the households in this study, offer a digital interface that allows users to register, book cars, find cars, and communicate with the service provider should the need arise.

The informants interviewed in this study all used the smartphone application, and in some instances, the service provider's website on a computer. Entering the vehicle and paying for

fuel are accomplished using a smart card that is activated remotely. The only instance in which a user had to interact with another human being in order to pick up a car was with the P2P service provider, Nabobil, for which the user and provider had to meet at an agreed time and place to exchange the keys. The smartphone and web-based interface are now, for all intents and purposes, extensions of the vehicle in terms of mobility as a service. Furthermore, the operation of the interface forms, along with the operation of the vehicle, a complex of practices.

5.1.2 Skills and competence

There are a series of skills required to be a car sharing user. Based on the interviews conducted, I will focus on the following three: (1) the ability to use the digital interface; (2) vehicle operation; and (3) planning of activities and finances.

Using the digital interface

Equally as important as the digital interface's material characteristics are the skills and competences required to use the interface. It was very clear from the interviews that all of the informants were comfortable using the internet and their smartphones to book cars and manage their car sharing accounts.

Navigating digital interfaces is not a skill exclusive to car sharing. Most of the informants grew up around computers and have been using smartphones for years, which is to say that this is a skill that the informants already had prior to becoming car sharing users. What *has* changed, however, is that over the past few years, car sharing service providers have developed and improved their services in way that take advantage of prior changes in the behavior of their consumers – the companies have, in a sense, 'caught up' to the users.

One informant (3B) expressed satisfaction with the digital interface's ease-of-use and practicality, and went so far as to say that he derived pleasure from using it: "I also enjoy that it is easy to book online. To choose your car, you get a map and see what is closest and you can see different options". The interface may be easy to use, but not for all potential users. It cannot be taken for granted that all private car owners (or other mobility users) possess such skills – if taking one's own car out for a drive required navigating a website or smartphone application, it would be reasonable to assume that the practice of driving, as it exists today, would certainly be more challenging for some.

Even those informants for whom car sharing is no longer an effective mobility solution viewed the interface as a positive part of the car sharing experience. Although Household 7 stated that they will stop using car sharing, Informant 7B expressed appreciation for the ease with which he was able to book and pick up cars.

Planning

Planning skills and competence associated with car sharing can be broken up into those related to scheduling and organizing activities and those related to finances and paperwork.

Car sharing is a necessarily a more deliberative practice than the use of a private car. This is because a private car is readily and exclusively accessible to its owner in a way that allows for more habitual and even spontaneous use that is not contingent upon the demand of other users and the availability of an appropriate vehicle. Private car owners can decide at a moment's notice to take a trip to the beach or a relative's house; a car sharing user would need to book the car first, and also make sure to return it before the rental period ends. This requires an additional level of planning that involves not only ensuring the availability of a vehicle, but also scheduling and organizing activities to fit around vehicle availability.

The added planning associated with car sharing can act as a barrier to use. As Informant 6B, a former user, stated:

> "For me the only inhibitor from using CS is that you have to go through the same hoops as you do with a rental car. You might have to travel a shorter distance, but it's organizing, I need to figure out where the car is, I need to figure out how to work the system."

As a former car sharing user, this informant represents an instance in which recruitment to the practice took place, but retention did not, at least in part, because of the added burden of planning.

In addition to booking and picking up the car, use of shared cars requires additional steps such as installing car seats and weighing different transport options, which have to be planned around. As Informant 1B stated: "If it's a complex way of getting there that involves changing transportation with two kids who are under three, (it) is a bit annoying, so you choose the simplest way." At the very least, this requires that car sharing users be aware of their mobility options as opposed to private car owners, many of whom can treat driving as a default.

Furthermore, it matters that the sampling employed in this project recruited families with young children. Other types of users could very likely have a different set of needs and wants that affects mobility planning. Informant 1B goes on to describe how being a parent affects the sorts of activities the family engages in:

> "the thing that is most difficult is spontaneous uses of cars. But then again an advantage is that you generally don't plan for spontaneous car use over weekends… (Parenthood) changes how you visit one another, because everything is very, often planned, and planned well in advance, so there's little of the spontaneous. That doesn't really happen a lot."

Within the targeted demographic, planning of household activities is seen as a more integral part of everyday life anyway. The planning skills needed to use car sharing may be more compatible with such demographics as compared with those who do not see such planning as an inherent part of their lives.

There are also instances in which planning incorporates aspects of spontaneity that may not exist with private car ownership. Household 7 needed a car to go shopping, and because the rates were favorable, they decided to rent the car for the entire weekend. This presented them with the opportunity to drive to a swimming pool just outside of Oslo the next day. "That was a really nice family activity…but it wasn't planned. We used the car for Ikea and I took it for the weekend. And I think on Saturday evening, we decided to use the opportunity" (Informant 7B). Although the informant said that the family outing was not planned, it most certainly was planned – on Saturday night as he stated just afterwards. This was a new type of planning that was semi-spontaneous and predicated on the household's access to a shared car that weekend.

Planning and organizing are also associated with other practices related to car sharing. Key examples that will be discussed later in this section are shopping, maintenance, and the use of other modes of transportation.

Another type of planning associated with car sharing has to do with finances and paperwork. The informants reported a range of experiences related to car sharing and finances. For some, car sharing simplified finances – bundling the rental fee, mileage fee, fuel, washing and road tolls at the booking stage "makes it brutally honest what it costs to use the car" (Informant 3B). Furthermore, many informants expressed comfort in knowing that the cost of insurance

was built into the rental fee for the vehicle. For many users, simplifying and bundling the costs of use reduced the amount of financial planning needed.

On the other hand, car sharing also required additional financial planning because it requires that the user were able to pay the 'brutally honest' fee in the first place. This may involve actively saving money or limiting the use of household funds for other activities. Household 4 (potential users and current car owners) reported that they operate best with fixed costs and have trouble saving money for unplanned expenses. For this household, the simplicity and clarity of cost was with private ownership and not car sharing. Informant 4A compared using a private car versus a shared car for a trip to Sweden:

> "we're not very good at having a buffer. So when we have the car now, we know that's the cost every month, and it's always the same. So if we are going to Sweden, we have all the numbers… I think it would be different, like you said, if it just cost us 3,000 (Kroners) a month to use Bilkollektivet…a price that's the same every month…then I would go for it…But we can't suddenly pay 6,000 to go to Sweden for a week."

In both instances (HH3 and HH4), paying *à la carte* was associated with changes in the required financial planning. The interviews have shown that car sharing has the potential to reduce the need for financial planning in some respects (bundling of costs per trip) but increase it in other ways (household budgeting and monetary liquidity).

Vehicle operation

Skills and competences associated with vehicular operation of shared cars can be broken up into those having to do with the ability to drive, and those having to do with rules and regulations of the road.

First and foremost, the operation of a motor vehicle, whether shared or privately owned, requires that the vehicle operator knows how to drive. The simplest way to determine if a user has this skill is through the driver's license certification process. The skills required to obtain such certification vary from place to place, but all motor vehicle jurisdictions maintain some minimum standard that must be met in order to have the legal right to drive. Although this skill does not represent a departure from the incumbent regime, it bears mentioning because it

is such a clear-cut example of a documentable skill that is required to engage in the practice of car sharing.

The ability to drive also extends to non-certifiable skills. Informant 5A, who sold her car and began using car sharing several years ago, reported that she drove more often when she owned a vehicle. She felt more comfortable with her ability to drive when it was a more regular and habitual process: "That's the problem when you don't have a car of your own – you don't drive that much. So I'm not so sure of my driving as before." In this instance, the ability to drive a shared car was more challenging than the ability to drive privately owned car because the user had less 'practice with the practice'.

Frequency of use also has relevance to skills having to do with awareness of rules and regulations governing traffic and parking. Although informant 5A drove more as an owner than as a sharer, she still felt that she didn't use the car often enough as an owner to make it worthwhile.

> "I got so many fees and fines …because of the parking …sometimes they have to clean the streets, or sometimes they have to clear for snow and I used it too seldom so I didn't have an overview of that, so they towed it away all the time."

The informant suggests that if the she had used her privately owned car more regularly, she would have had a better grasp of the parking regulations. With the exception of P2P car sharing services, all shared cars in Oslo have dedicated parking spaces that are accessible throughout the day. The less she used her privately owned car, the more difficult it became to drive and park, until a tipping point at which an alternative mobility practice (car sharing) became the most convenient option. Car sharing, in a sense, liberated the user from the burden of the having to keep up-to-date on parking regulations.

Informant 5A's experience shows the complex nature of skills as an element on car sharing. On the one hand (regarding driving ability), car sharing required more skill and competence than the incumbent mobility practice. On the other hand (regarding parking rules), it required less skill or competence.

5.1.3 Meaning

Car sharing is laden with symbolic meaning. I will discuss these meanings as they relate to the following: (1) freedom and flexibility; (2) environmental protection and/or sustainability; (3) social relations; and (4) alternative lifestyles and business models.

Freedom

The freedoms associated with cars can, most broadly, be broken up into freedom *to* do things and freedom *from* having to do things. The latter is most relevant to car sharing.

The 'freedom to' mostly refers to the flexibility with which users can travel from point A to B. Urry (2004, p. 28) describes cars and the mobility system that surrounds it as follows:

> "Automobility is a source of freedom, the 'freedom of the road'. Its flexibility enables the car-driver to travel at any time in any direction along the complex road systems of western societies that link together most houses, workplaces and leisure sites (and are publicly paid for). Cars extend where people can go to and hence what they are literally able to do. Much 'social life' could not be undertaken without the flexibilities of the car and its 24-hour availability. It is possible to leave late by car, to miss connections, to travel in a relatively time-less fashion."

Many of the informants reported that car sharing provided them with a freedom to travel that they did not have without a car. However, this is mostly referring to the same freedom associated with owning a car. Car sharing can mimic this freedom, but not completely. Shared cars must be available; they must be paid for with each use; they must be picked up and returned at a specific location; they must be loaded and unloaded with each use. These are just some of the ways in which car sharing provides less freedom than private car ownership.

Household 6 and household 7 are both car sharing users that have decided to lease a car in the near future. Although they expressed satisfaction with some aspects of car sharing, both households cited the added independence and flexibility of leasing, which, in many ways, resembles the practice private car ownership.

Despite the many benefits associated with private car ownership, there are also many burdens. Car sharing was described by many of the informants as a way to be free from these burdens. Informant 1B, an active user, stated categorically "The joy of getting rid of a car is so

immensely great that I'd go to great lengths to never own a car again." Citing the difficulties and stress associate with parking, maintenance, expenses, and insurance, he and his partner both felt car sharing provided an optimal level of freedom and flexibility. Informant 3B expressed similar thoughts:

> "I like not owning a car…I'm not that interested in cars. Using a car is a tool for getting something done – transporting something, transporting us, going somewhere. For me, a car is not anything more. With car sharing, I don't have to take care of it. I don't have any responsibilities in fixing it because I know that will not be something for me. I'm not one who wants to go down and wash the car or fix something either."

In this situation, car ownership is necessarily tied to extra work that can be avoided with the use of car sharing. The burdens of such extra work will be discussed in greater detail in the next subsection of relations between practices.

Of the 13 informants interviewed in this project, only one (Informant 2A) used a car for daily commuting. The nature of his job requires that he meet with various clients and distributors, often on short notice, at locations spread out across the Oslo region. The informant lamented his dependence on the automobile:

> "I don't like cars and I don't like the way of living…it feels like I sit in the car for hours every day. Jumping out and in, driving ten minutes, jumping out and in, it's raining or it's too warm, or some car queues…I would love to not have a car… I didn't want a car before I needed a car."

For the other 12 informants, who use public transit and active transit to commute to work, car use, whether shared or privately owned, was reserved for leisure and other occasional trips. For these informants, even those who own or plan to lease a car, car sharing has a strong association with the freedom from having to take care of a vehicle, especially when it is not in use. This is to say that all the informants are fully aware of the lack of freedom attached to car ownership, and that those who choose to own, do so in spite of this lack of freedom

In a sense, cars are simultaneously enabling and inhibiting their owners. This burden is not unique to car sharing though. Many informants described a desire to live a less materialistic life with fewer 'things' and less waste. For the pool of informants in this project, it was not just the car that they wished to be free of, but all types of household objects (e.g. furniture,

clothing, appliances) they deemed to be unnecessary. This tendency or preference to not own will be discussed in greater detail in the subsection that describes sharing as a related practice.

Environment

Most of the informants in the project connect car sharing with environmental sustainability, both in terms of mitigating climate as well as reducing local air and water pollution. However, the interviews suggest that the strength or intensity of this association is not significant in terms of recruiting new users to the practice. Informants were quick to point out that the environment was not a strong motivating force in terms of determining their mode of transportation. Although practice theory avoids focusing on rational choice and moral structures, it is still interesting that many informants explicitly stated that the environment was not a significant factor in changing mobility behavior. As Informant 3B explains:

> "Excuse me for saying this but I am not a big environmental guy. This is hard to explain. I don't want to be environmentally unfriendly, but I don't care…I don't take any initiatives towards a better environment…it's more like I've given up my chances to change something in these micro decisions."

Informant 5A, an active car sharing user, explained that convenience is her main reason for using car sharing, but that there are some social benefits regarding conspicuous environmentalism: "I can say 'Oh, I'm a sharing person! I'm in Bilkollektivet! And that's good for the climate.' That's like a positive side effect". Most users had a similar outlook, which suggests that they generally want to help the environment, but that it is not central to the meaning of car sharing. As Informant 6B stated: "there's a baseline of climate and environment in most things that we do". However, as evidenced by their plan to lease a car, this baseline was not strong enough to retain Household 6 within the practice of car sharing.

The same informant also expressed skepticism regarding what he felt was the perceived environmental benefit of car sharing by questioning the environmental impact of the car's end-of-life disposal:

> "The end of life is the worst environmental issue with cars…The emissions are the emissions are the emissions. But what you do with the car when you trash is – do you reuse the parts? Do you just like squish it together and throw it away? The handoff stage is what I would worry about."

A more comprehensive understanding of end-of-life materiality as it applies to car sharing would cover regulatory frameworks that address vehicle disposal, the manufacturing processes that create the materials in question, as well the impact of car sharing on the total number of vehicle on the road. For Informant 6B, the end-of-life materiality and environmental meanings associated with car sharing were very similar to that of car ownership.

Informants also reported changes in environmental meaning. Household 1, for example, stated that they began using car sharing almost entirely for economic and convenience factors, but that over time, the environmental meaning of car sharing has become more important. Informant 1B explains: "the scales have changed… the economic and convenience reasons are less important now than when we got into it" Informant 1A continues:

> "Suddenly, the climate aspect, I see it a bit more. I think it's also a good thing for the children, that they, that we're a family that whenever we're going somewhere, we can go by train. And that they are accustomed to going there by train and not just like, hop into the car and go wherever".

Although the informant views trains as the environmentally friendly alternative, this has relevance for car sharing because of the negative meaning attached to the private car.

The environmental meaning of car sharing, in and of itself, may not be as important as some of the other meanings associated with private car ownership. However, despite the moderate or weak environmental meaning associated with car sharing, the association of private fossil-fuel driven cars with environmental harm was strong. Informant 4A, a potential user, stated: "I often choose to not take the car often because I'm thinking about the environment. That's the main reason for not taking the car, but we have it… that's on my conscience that we take the car"

Social relations

The social meaning of car sharing is very similar to the social meaning of using a private car. A shared car allows users to visit friends and family, as well as spend time with one another inside the car. Informant 4A described how she uses the car as a way to spend time with her daughter: "She's three years old and she often asks if we can just take the car and drive. We listen to music and sing and, yeah, I think it's fun." Driving with no particular destination

captures the way in which the car is more than just a mobility product. Similarly, cars allow users to temporarily withdraw from social environments. Informant 4B, for example, stated that he used the car, not to foster social interaction, but more as a social escape: "I love driving actually. I prefer to be alone actually. I can sing…It's some 'me time'. I get to play what music I want".

The most common way in which the car had social meaning was as a tool for visiting people. Informant 2B (car owner) viewed the family car as the most convenient way to visit relatives who live several hours away: "I think we wouldn't have a car if our relatives and closest family lived here. I live five hours away from here in Sweden and *Informant 2A*, her parents live four or five hours south in Norway." This contradicts previous statements by the informant that state that the car is used primarily for work, but it still highlights the importance of visiting family.

The social meaning of cars is mostly applicable in a non-commuting context. Although Informant 1B did carpool to work for some years prior to becoming a car sharing user, for the entire pool of informants, commuting to work in a car had either zero or negative social meaning.

There was only one significant observable difference between the social meanings of car sharing and private car ownership. Many of the car sharing users expressed a strong connection with the city and their neighborhoods, including its residents. This will be discussed in greater detail in the subsection that deals with residential selection as a related practice.

It should also be noted that several informants stated that they began or considered using car sharing based on recommendations from friends, family or colleagues. User informants noted that although the topic of car sharing does come up from time to time in everyday conversation. They speak positively about it, but do not actively promote it or go out of their way to recommend the service to others.

Alternative lifestyles and business models

Many of the informants in the project viewed car sharing to be part of an alternative lifestyle. Informant 3A recounts her family's response to her use of car sharing: "they thought that it was just something alternative and fancy that we wanted to try". The implication here is that,

for the family, car sharing was just another trend or fad – a far cry from a component of a societal transition. Another informant (2B), who would like to use car sharing, but whose job requires him to own a car, stated:

> "Everybody back home in my home town bought a car at an early age. It was mandatory."

When asked why he didn't follow that pattern, he replied:

> "I was clearly different than all my friends. There was no option at all to stay in that town. I wanted to be a bartender. I wanted to work as an architect…I wanted to travel to metros and get drunk and do cool urban things."

Another common theme in the interviews was the connection between being alternative and urban identity. Although this will be addressed mostly in the section on residency as a related practice, it bears mentioning as part of car sharing's 'alternative' meaning. Informant 1B directly addressed this insofar as it can be considered 'cool' to live in a particular neighborhood and not own a private vehicle. He first described some of the meanings attached to cars in general:

> "You have to actually present an alternative that will let people keep their identity bits, or at least change their identities into something that's equally valuable to them…Because it's cars as a status symbol, it's also cars as a sort of the American symbol of freedom…"

The informant went on the describe the meaning attached to not owning a car:

> "It's a very hipster symbol… not owning a car is a statement in and of itself…we, if things do not change dramatically, won't ever, probably never need to own a car. And that is sort of a statement as well. It adds to the hipster points – living in Grünerløkka and not owning a car."

According to this informant, in order for a practice to change or be replaced, its meanings must change or its practitioners must be 'compensated' with other meanings. As this informant sees it, the meanings of status and freedom can be replaced with so-called 'hipster points'. It should be noted that the hipster is an embodiment of all that is alternative and urban in the early 21st Century (Pfeiffer, 2015). Furthermore, these statements were made in a

conversation about car sharing – such meanings are a part of constitutive elements of the practice of car sharing, but are not exclusive to it. It may be more useful to consider this meaning as a more integral part of the related practice of residential selection.

Another aspect of alternative lifestyle that was particular to the context of Oslo was the importance of alternative business models. For many informants, it was attractive and important that the car sharing platform was not a profit-driven corporation, but this was tempered by a mistrust of non-institutional service providers. The three big car sharing service providers in Oslo are Bilkollektivet, Hertz Bilpool and Nabobil, which are, respectively, a member-owned cooperative, a corporate subsidiary and a P2P app-based transportation facilitator.

There were two generally consistent trends with respect to business model. On the one hand, informants liked the idea of a non-corporate platform and were, therefore, more likely to support what they perceived to be the alternative business models, namely, the cooperative and P2P platforms. Informant 5A, for example, stated emphatically about Bilkollektivet: "I *really* like it that it's member owned!" When explaining why he preferred the cooperative and P2P models, Informant 4B stated: "It sounds like an anti-corporate".

On the other hand, informants also expressed a greater amount of trust for institutional platforms (cooperative and corporate platforms) that have an organizational structure and dedicated staff to ensure reliable cars and service. Informant 3B elaborated:

> "I know it's kind of professionally run, so I know that the insurance and everything is covered. So in terms of professionality, I instinctively trust them more – a bit more skeptical about P2P"

In this respect, Bilkollektivet struck a perfect balance – it was not a corporation, which meant it was alternative, but it was institutional, which meant it could be trusted.

5.2 Mechanisms of change

5.2.1 Changes in the practitioner

I will describe the changes in practitioners in terms of their association with broad life stages as well as specific trigger events.

Life stages

The sampling and recruitment employed in this project ensures that all of the informants are at or near the same life stage, insofar as they have young children (HH5 had a teenager – the rest had 1-2 children under the age of 4). As such, I treat family life with young children as a distinct life phase. Without exception, the informants stated that their mobility needs and patterns changed after having children. Much of this has to do with transporting children and their equipment (i.e. cargo) to activities planned with children in mind. At an everyday level, this means delivering and picking up children from kindergartens and schools. This also means regular trips to medical facilities, leisure events and social gatherings. The informants reported that prior to having children, they would go out more often and engage in more spontaneous or unorganized activities.

According to the interviews, travelling with children involves a significant amount of planning and staying as local as possible. It's worth recalling Informant 1B's comment, mentioned earlier in the subsection on planning, that with kids, almost all activities are planned in advance. Furthermore, when Informant 2B, who enjoyed going out to parties and travelling before having children, was asked to describe his current leisure activities, he replied:

> "I would say that we're not that mobile for the moment. We do walks in the neighborhood, to a café or some window shopping…Sure, I don't say that we don't do that (engage in leisure activities), but we're not moving that far."

All of the household members interviewed stated that they preferred to stay as local as possible when travelling with children - longer distances tended to complicate matters. Having said that, all of the households also stated that since having children, they wanted or needed access to a car, from time to time, for trips outside of the local environment. Trips that would have been possible and/or comfortable by public or active transit, as a single person or childless couple, became uncomfortable and/or impossible with children. Given that most of the households preferred to live without owning a private car, car sharing was a way to fulfill this demand for occasional access without the burden of ownership. Household 3 is a good example of two people who are very much opposed to owning a car, and enjoy walking, running, bicycling and exploring their local neighborhoods. And yet, they felt that it was important for the family to have access to a car.

Informant 3A: We realized that with two kids, it was good to have a backup with a car.

Informant 3B: It's more difficult to get around without a car with two kids. So I think we realized that there were more often situations where we needed a car and also…we couldn't go around borrowing from friends when it gets more often. And buying a car was out of the question.

Household 7 also viewed the birth of their second child as the beginning of a new phase of life with respect to mobility. As Informant 7 explains: "I also think that it's (car sharing is) a bit more freedom when you have two small kids… it's not difficult to take the T-bane downtown, but if I want to go alone and with those two, then it's not possible." The birth of a child can be considered a trigger event, but for analytical purposes, I will consider it to be the beginning of a life phase instead because of the overall changes in household behavior, mobility and otherwise, that follow from it.

Two interviews also touched upon household use of car sharing as the children get older. Household 1 was optimistic in that they envisioned the use of car sharing to be easier without having to deal with car seats and the particular needs of infants and toddlers. As Informant 1B stated: "I think that when the children get older, it (car sharing) actually becomes *more* attractive". Household 5 was the only one in which there was an older child. Consequently, their mobility needs were different as compared with the other households. Informant 5A explained her motivations for using car sharing as follows:

> "So it's only because of changes in my life – my son was growing older and doing all these activities… he had skiing training courses somewhere in the woods, and football in other places"

As opposed to the other households who had relatively younger children engaged in activities in the local area, Household 5 had an older child, whose activities were much more spread out, often in locations not accessible by public transportation. Car sharing was, therefore, an even more attractive service as the child grew older and began participating in a more geographically distributed set of extracurricular activities. As such, one could say that by virtue of the difference in child's age, the members of Household 5 were in a different life phase than those in the other households.

Trigger events

The clearest examples of particular events that had a significant role in instigating the use of car sharing were also related to children. Earlier in this section, I described the experience of Informant 5A and her child that involved waiting in the cold for a tram after football practice ("I was like 'I'm going to have a car again'…I saw my baby freezing"). According to the informant, there was a direct relationship between this uncomfortable incident and her decision to become a car sharing user.

The use of the word 'decision' is important. Although practice theory decenters the human agent and focuses on the practice itself as the primary unit of analysis, it does not completely do away with agency in the theoretical framework. As mentioned earlier in Section 3.3, the experience of the practitioner is important and can and must be taken into consideration. Practice theory can incorporate decisions made by the practitioner, but this should overshadow the bigger picture, which is to say, the dynamic relationship between the constitutive elements of practice, the practitioner and other practices.

Household 7 described two separate trigger events, each one having taken place within the context of parental responsibilities. The first event helped convince the adults of the household to become car sharing users. The second event convinced them that their needs warrant the leasing of a private car.

When asked when they started using car sharing, Informant 7B described the time during which his wife was pregnant with their second child. There were regular checkups at an out-of-town hospital, which required access to a vehicle on a regular basis, but not all day, every day. The informant was introduced to the car sharing service provider through an Internet search. Although he was pleased with the booking and payment process, he was less satisfied with quality of the vehicle. Despite this dissatisfaction, the experience opened a window of opportunity for the family to start using the service more regularly. Recruitment to the practice was followed by retention – the household began using shared cars from another service provider, which had an equally functional booking and payment system, but better cars. Informant 7A distinguished between the initial reason for using car sharing and the reasons for continuing to use it:

> "when we started, it was primarily just to drive to the hospital. To get that freedom, we were less stressful knowing that we could take the car in and drive it…The other benefits, like, we can go to other places that public transport can't go – just an added bonus."

The recruitment, though, was predicated on mobility needs associated with pregnancy-related travel. Although car sharing did retain the practitioners within Household 7 for more than a year, they eventually decided to stop using car sharing. Both informants described an incident that took place two weeks prior to the interview in which one of their children needed timely (but not emergency) medical attention. The situation did not warrant an ambulance, but they were told by the hospital staff to bring the child in for a screening. In terms of timing, this was considered more serious than a pregnancy-related checkup. Booking a shared car and driving it home to pick up the family would have taken approximately 30 minutes. This was considered unacceptable and the family ordered a taxi, which took 15 minutes to arrive – also a longer wait than they preferred. As Informant 7B stated: "that was somewhat a turning point. We felt that if something happens, it's better to have, you know, a car so that you can rely on yourself." Almost immediately after this experience, the family decided to lease a car to have access to one whenever they needed.

It should be noted that Household 7 is the only one in the sampled pool that does not live in the urban core of Oslo. About six months prior to the interview, the household relocated residence from the Grünerløkka neighborhood of Oslo (where most of the other households reside) to the municipal periphery in the eastern part of the city. According to the two informants in the household, their mobility needs and behavior changed dramatically as a result of this relocation. The importance of residential location will be discussed in greater detail in the next subsection on practices related to car sharing.

5.2.2 Changes in related practices

In this subsection I will elaborate on practices that are related to car use, both private and shared. I will focus on: (1) residency and choice of neighborhood; (2) parking and maintenance; (3) shopping and home delivery; and (4) other forms of sharing. I will not carry out an in-depth analysis each of these practices using practice theory. Rather, I will focus on those elements and mechanisms of change that are most relevant to car sharing.

Residency and neighborhood

There are two aspects of residency that I will focus on: (1) the relationship between location of residence and mobility behavior; and (2) the meanings attached to residential location.

A common thread throughout the interviews was that the informants did not have very strong feelings about car sharing per se. There were certainly personal and social meanings associated with car sharing, but it was, first and foremost, seen as a tool. This is not to say that the informants did not care about mobility – quite the contrary. Mobility was crucial, but car sharing was merely a part of a larger fabric. The informants expressed a great deal of concern with regard to their overall mobility, especially with respect to where they live.

Almost all of the informants stated that they chose their current residence, in large part, because of location and connectivity. Informant 3B explained it rather simply: "of course, we wanted a place that was central enough that we were not dependent on public transport or having a car, that we could walk most places." Similarly, Informant 1B explained:

> "I think having work within walking distance is an incredible asset in life. It makes everything really simple, because it cuts out a lot of logistics in everyday life. I think the hour you spend in a car, going to Stabæk in the queues, or the time you spend travelling by train to wherever you're going, is time that that's taken away from the things that you want to do, and being able to walk to work in 15 or 20 minutes, or being able to ride a bike in 5, is an added value to life."

With the exception of Informant 2B, every informant in this project commutes to work by active or public transit. Although some of the informants expressed frustration with taking public transit to work, none of them wished to be in a situation that demanded driving more. In most cases, the decision to live in a walkable and public transit oriented neighborhood was an active choice. This did not, however, totally eliminate the need for a car. For those households that use it, car sharing was a means to fulfill an occasional need to drive in an otherwise urban lifestyle.

This echoes the findings of a previous Australian study (Dowling and Kent, 2013) that found that car sharing car sharing is more likely to succeed in denser, more walkable, transit oriented neighborhoods. The use of car sharing only makes sense within the context of the informants' determination to live in a walkable and connected urban environment.

The experience of Household 7, which recently relocated residence from Grünerløkka (urban core) to the municipal periphery, highlights this connection between urban residency and car sharing. This was the only household to experience a recent residential relocation. Their decision to stop using car sharing and begin leasing a private car is certainly related to their relocation. Although all of the households in this project own their homes, when Household 7 lived in Grünerløkka, it was as renters. The main reasons cited for moving to their current residence was: (1) the need for more space following the birth of their second child; (2) the desire to own a home sooner rather than later in what they perceived to be a bullish real estate market; and (3) real estate prices in Grünerløkka were higher than they were willing or able to pay.

Although the current residence is within walking distance of a metro station, the local kindergarten and a grocery store, there are very few opportunities for leisure or non-grocery shopping within the neighborhood – a marked contrast with Grünerløkka. It is worth recalling that the informants in this household were reluctant to own or lease a car and were quite satisfied with car sharing in their previous neighborhood. When asked if they would have preferred to stay in Grünerløkka and continue to use car sharing if they could have afforded it, both informants replied unequivocally in the affirmative.

All of the informants in this project insisted (to the extent possible) on living in a neighborhood where the reliance on a car was minimal, even for those informants that owned a car. Again and again, residency was more important than any decision or action having to do with car sharing, which is not to say that they prioritized residency above mobility. Rather, residency and mobility went hand in hand and exhibit a potentially co-evolutionary relationship. The nature of this relationship will be taken up in greater detail in the upcoming discussion section.

The relationship between residency and mobility also reveals important meanings associated with living and being mobile in a neighborhood like Grünerløkka. Of particular interest is the meaning associated with walking and cycling – that of freedom and not being dependent on a motor vehicle or pre-established timetable. Most of the informants preferred public and active transit to driving, but walking and cycling were, by far, the preferred modes overall. Such inclinations have a functional dimension, in terms of convenience and reliability, but it is also laden with meaning, in that it corresponds with a particular image of urban lifestyle that the informants hold to be important. Informant 3A viewed walking as a way of life:

> "We always walk, it's our way to live…it's our way to get to know new things, get to know better where we live. And again it's a chance to move, a little bit, your body and if you're working, if you're studying you can just go and have a walk. It's healthy and it's relaxing. There's no stress about it. Of course, it's a little bit more time consuming, but it's your time – it's time for yourself."

Based on the experience of Household 7, it may be the case that such freedom is only possible in the urban core where most of the households in this project reside. When asked about her preference for modes of transportation that don't rely on cars, Informant 5A responded: "I enjoy it very much, especially walking…but bike is the ultimate freedom thing." The informant went on to describe her relationship with her neighborhood and her residential location:

> "I could never live in a house in the suburbs… yeah just knowing that there are opportunities, but I don't have to use them. Just noise from the tram, and it's good to hear the voices outside."

Once again, the informant's relationship with her local environment extends beyond one of mere convenience and utility. For one household, their choice of residence has profound meaning with respect to what sort of environment they wish to provide for their child. Household 4 explained how they had initially expected to move out of the city after the birth of their child but were pleasantly surprised by their relationship with Oslo:

> Informant 4A We talked a lot about it because we thought that we have to have a house, (that) we have to have a childhood for her, the same way we had, (that) we have to live close to our family. And then we got her and I just loved living in Oslo because there's so many…
>
> Informant 4B We started using Oslo more when we got (child's name).
>
> Informant 4A Yeah, we go to the theater. We go to the cinema. She goes to dancing. Almost every day something is happening for her.
>
> Informant 4B And cafés! I didn't use cafés before that much – I just wanted a coffee to go. Now you can go to a café and sit down with (child's name).

Informant 4A … now it's so different for me (than) before I got her because now I think I want to give her Oslo and everything the city has to offer.

Informant 2B was more concise in communicating his fondness for city life: "I'm an extremely urban person – I really love to spend money sitting at a café, spending 150 Kroner (approx. USD 18) for a coffee and a donut." In reality, it is virtually impossible to spend that much on a coffee and a donut in Oslo, but the informant's hyperbolic statement captures the intensity of meaning he derives from living in a place like Grünerløkka. Household 7 was the only one to experience a diminished connection with the city:

> "…we lived downtown. On the weekends we always went out. So now it's just, we're getting a bit isolated… it was, like I said, nice the first few weeks, especially during the summertime. Since we had the snow and everything was dark and everything was just, a bit gloomy."

Household 7 did not leave Grünerløkka because they did not appreciate it – residing there had similar meaning for them as with the other households. The key difference was in the financial ability to purchase a residence in such an area.

Parking and maintenance as sub-practices

Like operation of the digital interface, parking and maintenance are examples of practices that are so 'tightly integrated' with the practice of driving that they form a complex of practices. In this analysis, they can be considered 'sub-practices' of the more general practice of private vehicle use – the former are absolutely necessary in order for the latter to be practiced.

Many of the households interviewed in this project reported that these two sub-practices were the cause of much stress. The ability to avoid this stress was cited as one of the key benefits of using car sharing. Informant 1B described how he and other car owners would avoid using their cars for fear of losing a parking space:

> "Parking is hell. When you find a prime parking spot, you stick to it for as long as humanly possible… Don't move it for the life of it! No one with a car in Sagene (previous residence) would move their car on the weekend. It's risky business. And you see it outside here as well. People who have a car – they'll be very reluctant to move the car if they've found a spot on our street. You have cars that basically stand there all autumn because there's so much, incredibly much leaves on them."

Other informants also reported not using a privately owned car because of difficulty associated with parking. This is to say that in such cases, problems associated with one practice had negative effects on the entire complex of practices. Put simply, parking difficulty discouraged car use. With reserved spaces, car sharing eliminates this difficulty. With respect to parking, the user informants reported greater mobility and less stress as a result of using car sharing. Of particular interest is that parking caused stress even for those informants who did not drive. As Informant 6A explained:

> "I shared a flat with friends, and one of them, she had a car, and we never used it because she was so afraid of not finding a parking spot when we got back home. I still remember how disappointed I was when it was raining and cold and she said 'no, we have to take the bus'"

Household 6 avoided this problem by renting a parking space for 1,500 Kroners (approx. USD 180) per month. At the moment, the space is empty as they no longer own a car and have yet to begin leasing. This was not considered an acceptable solution for the other households. On the other hand, Household 3 has a parking space that they do not use and rents that out as a source of supplementary income.

Informants' comments on parking were similar to those on maintenance. Although stress relate to maintenance did not discourage use, the absence of this stress was a clear advantage of car sharing. Once again, Informant 1B explains:

> "Someone else was going to take care of all the maintenance work, which was a genuine pain in the butt when we had the car. It was a good selling point (for car sharing), so just pointing out that you don't have to change tires, you don't have to take it to service, you don't have to refill the oil…everything just works!"

With respect to parking and maintenance, the complex of practices associated with car sharing is much simpler than that of private car use. For some users, this has important meaning, particularly with respect to freedom. As mentioned earlier in in this section, car maintenance added extra burdens and responsibilities that took away from the freedoms of the informant. The user informants in this project wanted to be able to use car sharing and not have to think about it when they weren't actually using it.

Shopping and home delivery

With the exception of occasional trips to stores outside of the city center, car sharing was not used by the households for shopping. On an everyday basis, most households carried out their shopping by walking to their local stores or taking public transportation to commercial areas within the city. The households also made use of home delivery on a regular basis.

There are two recent developments in Oslo, with respect to home delivery, that is relevant to the mobility practices of the households. First is the emergence of Foodora, a food delivery company that does not produce food, but partners with restaurants to deliver orders to customers' homes for a share of the revenue. Prior to launching in 2015, there were very few options for home delivery of food in Oslo – there are now hundreds of local restaurants that use the service. Many of the households interviewed have used Foodora and were satisfied customers.

If one were to analyze the constitutive elements of ordering meals from restaurants, the food itself is an important material element, but so is the ability to experience the physical environment within the restaurant. Therefore, Foodora did not put an end to going out for meals – rather, it gave households additional options by removing personal mobility from the equation.

Another recent trend that is relevant to household mobility is the rise of home delivery of groceries, for which there are multiple services available in Oslo. Given that all of the households lived within walking distance of at least one large grocery store, distance was not a big factor – quantity of food and frequency of shopping was. Households that used grocery home delivery services reported that with home delivery, they were able to shop less frequently and in a more organized manner – most typically a large order at the beginning of the week with a clearer overview of how much was being spent. In many ways, the shopping practices of the households interviewed in this project resemble those of suburban households who drive to grocery stores and buy in bulk – the key difference being the absence of the car.

By removing the need for personal mobility, home delivery makes it easier and more attractive to live in Grünerløkka and not own a car. As the informants in Household 1 stated:

Informant 1A: Well we have outsourced the part of the grocery shopping to kolonial.no…So once a week, we have a major delivery… it also has a lot to do with our car using necessity.

Informant 1B: Nearly every time it's going to be cheaper if you're going to have it delivered. Cheaper and more convenient and you don't have to carry it up four flights of stairs.

Informant 1A: Also if I have to do that and carry it or collect it at the post office, it's much more convenient than buying it somewhere with a car.

The rise in popularity of home delivery services in Oslo does not directly support the use of car sharing, but it does provide a new incentive to not own a car.

Other forms of sharing

All of the households interviewed, including car sharing users and potential users, indicated that they had positive opinions of sharing and are prone to practice sharing in other areas of their life. Of particular interest were other forms of sharing that, like car sharing platforms in Oslo, rely a digital interface to facilitate sharing 'transactions'.

The most notable examples of such sharing platforms were AirBnB, an international peer-to-peer online marketplace that allows users to rent out their homes on a short-term basis, and Finn.no, a classified advertisement website that allows users to, among other things, buy, sell and give away goods. All of the informants had either used or considered using AirBnB. Some had even used it to rent out their own apartments out while out of town. Every single household, however, was an active user of Finn.no. The mothers of young children were particularly adept at using Finn.no and navigating its interface. With the exception of Informant 5A, who had an older child, all of the mothers interviewed substantiated this connection between the life stage of early motherhood and the use of Finn.no to buy, sell and give away children's products online.

Although Household 4 recently purchased a car, they had considered car sharing multiple times. At one point, the two informants had spoken with another household with whom they were friends, about purchasing a car together – a sort of informal car sharing cooperative.

With respect to the practice of giving away household goods on Finn.no, perhaps the most important factor is convenience. All of the informants who used Finn.no stated that it was a very easy way to get rid of unwanted 'stuff' – the fact that it is useful to somebody else was almost an added benefit.

> Informant 1A Yeah, I think it's nice to think that things can be reused and not thrown away and it's also convenient because if you give things away on Finn, people show up like after ten minutes and they carry it down the stairs.

> Informant 1B the alternative is often to throw it away…when we moved in here there was a really old stove that was broken. I don't even know if it worked, but the handle was off. It was definitely 15 years old. And putting it up and giving it away on Finn, it took 2 minutes, someone drove here from like, Lørenskog to pick it up.

Sharing was also connected with the sense of freedom and liberation from material objects. Many informants described the satisfaction of getting rid of things that they felt they did not really need. As with cars, ownership of material objects was associated with the burden of having to store them and take care of them. This was especially frustrating when the objects were not being used by the informants.

The meanings associated with sharing were also similar to the sentiments expressed in the conversations about environmental sustainability. Informants were eager to reduce their carbon footprint and live a less materialistic life, but convenience was almost always more important.

6 Discussion

In the previous section, I used the practice theory framework to organize the results of my interviews. In this section I will conduct a more in-depth analysis of the results using practice theory and relate this analysis to the socio-technical transitions literature described in Section 2.

As a point of departure, I will use the five critical insights taken from Pantzar and Shove's (2010) study of Nordic walking by applying them to the use of car sharing in Oslo. Based on

the interviews, I can make the following five observations (the italicized words refer to terms used by the authors in the original article).

1) In order for car sharing to take root, the *requisite ingredients* must already exist.
2) These ingredients must be combined and *integrated* by users in order to form a practice.
3) Innovation with respect to car sharing is always a *collective accomplishment*.
4) Promoters and practitioners of car sharing operate under distinct *conditions and circumstances*.
5) Car sharing practitioners and promoters may exhibit a relationship that is co-evolutionary in nature.

The following three subsections will be based on these observations. Observations 1-2 will inform the discussion on the integration of elements of car sharing. Observation 3 will inform the discussion on car sharing and the sharing economy. Observations 4-5 will inform the discussion on the differences between promoters of car sharing and its practitioners.

6.1 Integrating the elements of car sharing

At first glance, car sharing does not appear to be a radical innovation. In terms of materials, skills and meaning, so much of car sharing resembles the incumbent practice of mobility within the context of automobility. Car sharing is not a new technology per se, but a shift in terms of how existing technologies are used. Herein lies one of the key strengths of car sharing insofar as its potential contribution to a mobility transition – the key ingredients are already in place.

Not all of the elements described in the Results Section are necessarily ingredients of the practice. With respect to material elements, for example, weather and spatial proximities are elements that can influence mobility behavior and can, therefore, be considered factors. Ingredients, on the other hand, are necessary for the practice to be carried out – they include the car itself, physical infrastructure for automobile traffic, and the digital interface for booking and communication.

None of these ingredients were developed with car sharing in mind but facilitate it nonetheless. Similarly, none of the informants in this study were eager to use car sharing prior

to engaging in the practice. Such expectations are worth considering because of the overwhelming pressure to conform to the dominant practices of the automobility regime.

From a transitions perspective, existing physical infrastructure is the most challenging of the material ingredients and is often a critical barrier to mobility transition because it is so difficult to change. Cars and smartphones are much easier to purchase than a bridge or tunnel is to build. Decisions and actions regarding urban infrastructure exhibit tendencies of path dependency wherein actors within the system prefer incremental adaptation and are reluctant to take big risks (Bertolini, 2007, p. 2000). Oslo, like most cities in the world, has to a large extent, accommodated automobility. The advantage for car sharing is that, in terms of infrastructure, it is fully compatible with automobility. Oslo already has the roads and parking facilities to accommodate car sharing. This is to be contrasted with other transition efforts, such as electric automobility or mass transit expansion, both of which would require massive and long-term investment in infrastructure.

In order for users to integrate these existing ingredients, they must have the necessary skills to carry out the practice. As was evident from the interviews, the informants possessed most of the required skills prior to becoming car sharing users. To some extent, this should come as no surprise – the sampling employed specifically targeted and recruited households that were active users or were actively considering car sharing. But the timing of the acquisition of these skills is more important than the fact that they possessed the skills.

None of the informants reported having had to learn how to use a smartphone or the car sharing app in order to use car sharing – the digital interface for car sharing services were similar to so many of the apps and websites that they already used. Similarly, none of the informants went out and acquired a driving license in order to use car sharing. Almost all of the users were, at some point in their lives, regular drivers of privately owned vehicles.

It should be emphasized here that the households chosen are not a representative sample. The interview results do not provide any indication of what the skills and competences of the general population are. The informants in this study were all adept at using computers and smartphones for web-based communication and transactions. Practices that rely on information and communication technology (ICT) have the potential to exclude certain potential users such as the elderly, who are less likely to own computers and smartphones and are also less likely to engage in online commercial activities (Statistic Norway, 2016).

Importantly, although the interviews were useful in capturing the current mobility behavior of the informants, they gave no reliable evidence or insight into how the skills situation might be in the future. Some of the skills that car sharing relies upon are 'inherited' from the automobility regime. It should not be taken for granted that pre-existing skills that were associated with and potentially motivated by the automobility regime would maintain their presence in the event that the automobility regime is replaced.

A sufficient pool of certified drivers in the market is one such skill that may or may not remain at levels sufficient to sustain car sharing as a mainstream or dominant mobility practice. Determining what that number is would require further research, but there are indications that fewer young Norwegians are obtaining driver's licenses, and that those who obtain a license later in life tend to drive less frequently (Nordbakke, et al. 2016). In this regard, two informants (3A and 6A) out of thirteen did not possess a license and were therefore ineligible to operate a shared car. The licensed drivers in the sample pool acquired licenses within the context of automobility – car sharing was not on their mobility horizon yet. A good line of future research would be to investigate whether people would obtain driving licenses in order to primarily use car sharing.[6]

Herein lies on of the key areas in which practice theory can contribute to the socio-technical transition debate. The novel integration of the pre-existing elements that came with the incumbent regime enabled the households to defect from automobility and be recruited to car sharing, but it remains to be seen whether this practice can sustainably reproduce itself by retaining practitioners given the uncertainty of some of the prerequisite elements. As compared with the emergence-development-breakthrough-replacement framework described by Geels, the process of recruitment/defection and retention/reproduction provides a much richer conceptual framework with which to examine how user adoption of a niche innovation can change the trajectory of the regime, or to use the language of practice theory, how a practice such as car sharing can undergo formation and reformation in a manner that it can sustain itself and replace incumbent practices.

Driving licenses and general skills at motor vehicle operation are just one example of a prerequisite element that would need to maintain itself in order for car sharing to upscale from a niche practice. Given that 87% of Norwegian ten- and eleven-year-olds own a smartphone

[6] It should be noted that a decline in the pool of licensed drivers could not only challenge the rise of car sharing, but also threaten the dominance of automobility.

(Nymo & Ingebrethsen, 2015), it is reasonable to assume that skills at navigating digital interfaces will either maintain itself or increase.

Meanings associated with car sharing are less certain in terms of their durability. As with other elements, the freedom associated with car sharing was inherited from private automobile use, but only partially. Car sharing gave users the freedom *to* do things, but given the non-exclusivity and temporally fixed duration of use, this freedom was not as strong as with private ownership. On the other hand, car sharing provided users with new freedoms – freedoms *from* many of the burdens associated with the dominant mobility practices of the incumbent regime. How these two sides of freedom evolve will have a big impact on the retention of practitioners and related reproduction of the practice. I will discuss the second freedom more in third subsection dealing with promoters and users.

6.2 Car sharing as a collective accomplishment

To say that an innovation like car sharing is a collective accomplishment is somewhat tautological. All forms of sharing are collective by nature. The significance of the statement is more fully appreciated when considering: (1) the spatial quality of the collective accomplishment; (2) the social meaning of collective accomplishments; (3) the history of the development of car sharing; and (4) the collective trust than enables car sharing and the broader sharing economy.

Firstly, car sharing as a collective accomplishment has a spatial dimension. It requires not just the existence of users, but a geographic concentration of them as well. In the previous section, I discussed spatial proximity as a material element of car sharing. The significance of this is that users must be willing to travel to the parking stations in order to pick up and return vehicles. For user informants who lived in neighborhoods like Grünerløkka, which has a high concentration of shared cars as well as users, this willingness was present. In the one instance of an informant moving out to the municipal periphery, with lower concentrations of shared cars and users, car sharing became much less attractive. This suggests that in addition to requiring a sufficient number of users, car sharing is the type of innovation that is viable only when its users are located close to one another.

Secondly, some users are aware that the innovative product or service represents a collective accomplishment and want to either contribute to or tap into it. Informant 1A, for example,

stated that she was motivated to use car sharing, in part, because of "this feeling that somebody had a great idea and you want to support it. It's an interesting thing to be a part of". What the user reported was not totally separate from previously described meanings associated with freedom and the environment, but rather, the awareness that these meanings were part of a larger community had meaning in and of itself.

Thirdly, car sharing is historically rooted in cooperative movements. The first instances of formal or organized car sharing were predominantly small-scale cooperatives started by local community members in cities around Europe as early as the 1940s (Shaheen, et al, 1998, p. 38). The most popular car sharing platform in Oslo and in Norway, *Bilkollektivet*, is a cooperative that was founded in 1995, much earlier than any of its current competitors (Bilkollektivet, 2017). As was evident from the interviews, despite the presence of multiple options, the cooperative platform in Oslo maintains special meaning to users. Even though none of the informants were active members of the cooperative in terms of management and administration, many expressed comfort in knowing that the organization was run by other users. According to Truffer (2003, p. 139) car sharing is a good example of a user-led innovation at both the starting phase as well as the expansion phase.

And finally, the experience of the informants with respect to car sharing reflect similar trends in the broader sharing economy. As with other forms of sharing, car sharing is predicated on reputation or trust in other users and the institution that governs the collective (Botsman, 2012). By allowing users to operate independently of one another, automobility has developed without the need for such trust. Car sharing necessarily makes the user more dependent on other users, not only temporally and spatially, but also with respect to how well they treat the car.

Using the typology of trust developed by Hawlitschek, Teubner and Weinhardt (2016), the interviews showed that users' level of institutional trust was greater than their interpersonal trust. Although the informants in this study were eager to support a non-corporate business model, they were hesitant to engage with P2P providers because they did not feel individual 'peers' were held accountable. Bilkollektivet's cooperative model struck the perfect balance between alternative business model and institutional trustworthiness. If car sharing and other shared goods and services are to gain in popularity, there must be ample institutional trust or reputation that is capable of off-setting any suspicion or lack of trust users may have among one another.

6.3 Practitioners and promoters (companies)

The distinct conditions and circumstances of promoters and practitioners reflect a disconnect between top down and bottom up processes that constitute the practice of car sharing. Companies can create a product or offer a service but cannot control or always predict how users will use it (Pantzar and Shove, 2010, p. 457). As mentioned earlier in this section, the process of integration is carried out, first and foremost, by practitioners. This is not to say that promoters have no role – obviously, they promote it.

It goes without saying that, like most companies, car sharing service providers emphasize the convenience and costs factors that make their platforms attractive. More interesting are the meanings that they push forward in association with their service. As Pantzar and Shove (2010, p. 457) stated "Companies mobilize concepts that have widespread currency and generic appeal" – in the study of Nordic walking, health and well-being were given as examples of such concepts. Car sharing providers in Oslo focus a significant amount of attention to the ideas of freedom and environmental sustainability. It should come as no surprise that these are the two principal meanings analyzed earlier in this thesis.

This commonality, however, does not mean that a provider knows or controls how practitioners use these meanings to integrate the elements of practice. In the Results and Analysis Section, I mentioned that none of the informants noted environmental concern as a deciding factor in terms of becoming a car sharing users. On the other hand, all of the informants expressed the desire to do some good (or less bad) for the environment, and multiple households stated that the importance environmental sustainability has changed over time. The case of Household 1 was especially interesting in that they claimed to have begun the use of car sharing for reasons having to do with convenience, but cited environmental concern as one of the chief motivations for continuing to use car sharing.

What this suggests is that environmental meaning is a weak element in terms of recruitment of practitioners and the initial integration of the practice, but that it may be a strong element in the retention of practitioners and the reproduction of practice. In other words, nobody starts using car sharing because of the environment, but if you're already using car sharing, environmental meaning may help in maintaining that use. This is particularly important in the formation of habits and routinized behavior, which is, after all, central to what a practice is.

Practice theory's biggest potential contribution to the study of socio-technical transitions is in highlighting and explaining user adoption of niche innovations as a process of recruitment and retention that results in the integration and reproduction of new practices that replace old ones. As mentioned in the literature section, the MLP describes the process by which a niche innovation becomes a part of the regime as one of emergence, development, breakthrough and replacement (Geels, 2005, pp. 684-5) or predevelopment, take-off, breakthrough and stabilization (Rotmans, Kemp & Van Asselt, 2001, p. 17). Whether using these niche-regime integration phases, or the transition pathways typology described earlier, the MLP framework attempts to capture macro and top-down perspectives. Practice theory, on the other hand, provides for a richer and more detailed understanding of the micro-phenomena that takes place as a niche becomes part of the regime.

This is not to suggest that car sharing will replace private automobiles as the dominant form of mobility in Oslo and other cities. Rather, understanding how user engage with car sharing, and how their conditions and circumstances differs from that of promoters offers tools with which the practice of car sharing can be upscaled to a mainstream or dominant mode of transport. The relationship between user and promoter circumstances and conditions is not static, but co-evolutionary. Promoters respond to how users actually use their products and services. There were several instances in the interviews in which the real-world use of car sharing by informants yielded concrete recommendations (from the users) for how to make car sharing more appealing. These recommendations will be discussed later in this chapter.

6.4 Practitioners and promoters (government actors)

In a transition context, the distinction between promoters and users should not be limited to car sharing service providers. It would be more worthwhile, practically and theoretically to also include government actors at various levels. Although most policy makers and regulators that work with mobility in Oslo are not actively promoting car sharing, they are often preoccupied with mobility transition.

The inability of government actors to predict or control how users engage with car sharing is similar to that of the experience of car sharing companies. The key difference is that the companies are promoting a particular service, namely car sharing, whereas government actors are more generally trying to mitigate the effects of automobility or move beyond it. If companies appeal to the meanings of freedom and environment associated with car sharing,

government discourse surrounding transitions, in Oslo and beyond, are overwhelmingly framed in an environmental light, specifically in combating the causes and effects of climate change and local pollution (Kingsley & Urry, 2009; Oslo Municipality, 2015; Oslo Municipality & Akershus County Council, 2015).

Incorporating environmental meaning into mobility strategies are important, but government promoters would do well to understand how this meaning operates. If environmental meaning is a better retention mechanism than a recruitment mechanism, then appeals to environmental sustainability or reduced carbon footprint are not likely to change user behavior. Following the identification and application of other more effective recruitment mechanisms, the environmental meaning of car sharing may hold more weight and help sustain a transition. Determining what these effective mechanisms for recruitment (to car sharing, or other forms of mobility) are would be is a good topic for future research. A good way to start would be by investigating how and why people live where they do.

6.5 The importance of residency

Although this project focuses on car sharing, the interviews suggest that informants did not use it because they like car sharing per se, but because it fit so well with other important priorities and practices. Promoters of car sharing, other forms of mobility, and transitions in general, would be well served by a greater understanding of these priorities and practices, the most important of which, as far as I have been able to identify, is residency.

The informants in this project all expressed a desire to live in Grünerløkka, or a similar neighborhood, to an extent far greater than any feelings they had for or against car sharing. Most were non-negotiable on the matter and even those that left expressed some longing to return. What attracted these informants to Grünerløkka was the urban character, the close proximity of stores and cultural resources, the sense of community and neighborhood, the local heritage, the alternative atmosphere, the access to public transit, the diversity and unpredictability, and importantly, the freedom from needing a car on a daily basis.

This desire for an urban lifestyle represents a *project* (see section 2.3) that the informants are striving to achieve. The collective and individual frameworks that combine to form this *project* were already in place long before the informants even considered car sharing. This is to say that these informants did not invent or construct the components of Grünerløkka that

make it attractive (e.g. walkable streets, café culture and boutique stores). Rather, they are being recruited into a series of established and contextualized practices that, when combined, form a *project*, or meta-practice, that I refer to as urbanism[7]. By urbanism, I do not mean just living in a city, but a particular way of living in a city that is embodied by the dense, walkable, mixed-use, historically grounded qualities of neighborhoods like Grünerløkka (Calthorpe, 2010). The project of urbanism was far more important to the informants than any feelings they had about car sharing.

These rewards of urbanism are often of no help, though, when it comes to visiting relatives in another town, picking up a large item from a suburban shopping center, or taking the family to the cabin for the weekend. These practices are also important - so much so that in a zero-sum scenario, the advantages of urban living may not be strong enough to compensate for the absence of these activities that require car use. In other words, if the informants were not able to occasionally drive to their relatives, their cabin or the mall, perhaps they would choose not to live in Grünerløkka, despite the benefits. Car sharing allows informants to avoid such a zero-sum scenario by letting them have their cake (live in the urban core) and eat it too (have access to a car for the few instances in which they need to drive).

Although residency is a very important practice – perhaps the most important one discussed in the interviews – and one that is closely related to mobility, I would not go so far as to say that mobility is a function of residency. The two practices influence one another, albeit asymmetrically. The importance of urban residency is impossible to ignore when trying to understand why the informants in this project engage in the practice of car sharing. For them, car sharing was merely a means to facilitate their preferred residential lifestyle, which had much more meaning in their lives.

It is worthwhile, though, to play devil's advocate – of course the interviews suggest that urban residency is important when the researcher limits the sample pool to people who choose to live in urban areas. The potential for bias is heightened considering that the sample pool consists of families with young children who, as discussed earlier (Purposeful sampling in sub-section 4.2), exhibit a residential pattern that runs counter to the standard narrative of suburban residency and automobility. This would be a problem if this project were seeking

[7] I use the term urbanism as a matter of convenience - mainly to describe the *project* 'undertaken' by the informants as being distinct from the process of urbanization. This thesis does not intent to draw direct connections to the academic field of urbanism or related movements like new urbanism. However, I would welcome and encouraged such connections for future research, or alternative terminology to describe the *project*.

representative data to make generalizable claims – it is not. What the interviews do illustrate is *how* the elements of car sharing are integrated by these users and how the integrated practice relates to other practices, especially residency.

It is worthwhile to consider the implications of the relationship between car sharing and urban residency, insofar as future trends in urban residency are concerned. There is reason to believe that the residential practices of the informants may not be entirely unique. Their experiences may be part of a larger demographic shift towards a new kind of urban growth, which may represent a systemic transition in its own right. By this I do not mean mere urbanization, which refers to growth in metropolitan areas; i.e. urbanization includes suburbs and other areas characterized by sprawl (United Nations Statistics Division, 2017). In fact, automobility went hand in hand with the decentralized, sprawling, metropolitan urbanization of the post-WW2 period (Logan, 2015) that contributed to the decline of so many urban cores. The larger trend that I am referring to is *re-urbanization*.

After decades of decline, there have been signs of re-urbanization in cities throughout the advanced economies of the world, whereby urban cores are growing economically and demographically (Champion, 2001, pp. 143-159; Bouzarovski, et al., 2010, p. 212; Haase, et al., 2008, p. 1076); Rérat, 2011, p. 1107). In an article about English cities Couch, Fowles and Karecha write "one of the clearest indicators leading to the claim of reurbanization has been the emergence of 'city centre living'" (2009, p. 321). Re-urbanization is more than just municipal population growth; it is indicative of a rise in the demand for a particular way of life exemplified by the urbanism *project* described earlier. Put simply, neighborhoods like Grünerløkka may not be outliers, but a sign of things to come in terms of residential practices.

This thesis builds on prior research that shows that car sharing tends to succeed in denser, walkable, transit-oriented areas (Kent & Dowling, 2013). If re-urbanization continues to intensify, it would provide newer markets for innovative mobility solutions like car sharing, with customers who are eager to abandon car ownership (Davis, Dutzik & Baxandall, 2012). Looking towards future research and/or policy, I envision two potential transition scenarios involving car sharing and residential practices.

In one scenario, car sharing and residential practices exhibit a co-evolutionary relationship in which people want to move to the urban core, but maintain occasional access to a vehicle. The two practices would be complementary and enable mutual growth. In the other scenario, re-

urbanization is independent of car sharing and will take place regardless of whether or not car sharing is available. In this case, it would be useful to incorporate re-urbanization, as an exogenous landscape force within the MLP framework and broader socio-technical literature. As a landscape force, re-urbanization would still apply pressure to the automobility regime and create windows of opportunity that car sharing could potentially exploit.

6.6 User recommendations

Over the course of seven interviews, several of the informants provided recommendations and potential innovations that they claimed would make car sharing more attractive. These recommendations and innovations are described below.

Child safety seat

Perhaps the most consistent complaint among informants was the difficulty associated with installing and uninstalling car seats for children before and after each use. Given safety concerns and legal requirements, the use of a car seat is mandatory for young children. Although the use of the car seat is non-negotiable, the technical specifications of the seat and the car around it are subject to change and improvement, i.e. innovation.

An example of such an innovation is the ISOFIX system, which was developed jointly in the 1990s by Britax-Roemer, a car seat manufacturer along with the automobile manufacturer, Volkswagen. ISOFIX is the international standard for child safety seat attachment points and makes installation a much easier and less ambiguous process. Despite the ease of installation, a tradeoff with the ISOFIX system, as pointed out by Informant 1B, is that it is very heavy and, therefore, difficult to transport to and from the car before and after installation.

Innovation(s) that could make a child safety seat either easier to install or transport outside of the car would eliminate a common obstacle to the use of shared cars among parents with young children. This could even include integrated child safety seats that can fold out of the standard adult seat, thereby eliminating the need to install. This would be another example of complementarity, whereby one innovation, car sharing, would be the beneficiary of a related innovation having to do with child seats.

Fixed pricing

Unlike child seats, which pose a very material and technical problem, pricing poses a challenge, not just in terms of actual cost, but payment methods and financial planning. Household 4 reported that they were not good at saving money and that this was at odds with the à la carte payment system that is prevalent with current car sharing services in Oslo. According to this household, they would be more likely to use car sharing if it had a subscription based payment system that would eliminate the need to plan and save money. Such a plan would have fixed monthly costs and a corresponding allotment of use, which can be measured in instances of use, duration of use, and/or km traveled.

Dedicated parking

Almost all of the informants stated that an increase in dedicated parking, particularly on-street municipal parking, would be a welcome improvement. Although car sharing already comes with dedicated parking spaces (with the exception of P2P), they are located in clusters that still require some walking by users. Although most households lived within 5-10 minutes walking distance of their nearest cluster of vehicles, they would prefer an even closer option. The general sentiment among informants was that when spaces are available close to home, parking is easier with private vehicles because there is no pre-designated space. Households would like for the mechanics of parking a shared car to resemble that of parking a private car in a near and available space. Such a scenario would most likely be viable only if the total pool of vehicles in the car sharing fleet were to increase so as to allow for an efficient distribution of vehicle supply.

Most importantly, the final decision on dedicated parking is not held by car sharing service providers or by users – it is a legal issue that is typically a matter of municipal jurisdiction. Such a change would be an example of how car sharing could be inserted into the broader mix of mobility transition policy. It is also possible that dedicating parking spaces for shared vehicles may lead to tension and backlash from owners of private vehicles who feel that their spots are being taken away.

Bundle with housing

Bundling residency with car sharing is not new. In fact, Household 1 was introduced to car sharing upon attending a viewing for a vacant apartment in Oslo that was part of a housing

cooperative in which all members were also automatically members of one of the local car sharing services. They expressed the desire for such an offering in their current housing cooperative. The other households all responded positively to the possibility of car sharing membership being an integrated part of cooperative housing, with the requirement that dedicated local parking would be available.

The bundling of housing and car sharing is not new though – one of the earliest formal car sharing services in the world, Sefage in Zurich, was started by a housing cooperative in 1948 (Transport Cooperative Research Program (TCRP), 2005) (Millard-Ball, et. al, 2005). In the Swedish town of Örebro, the municipal housing cooperative, ÖrebroBostäder, has been operating its own car sharing service, Ekobil, since 1993 (Örebrobostäder, 2017). In Oslo, the rental car company Avis offers an exclusive car rental service, called Avis Now, to members of OBOS, Norway's largest housing cooperative (Avis, 2017). Still, most car sharing services are not formally associated with housing organizations.

Bundling housing and car sharing has the potential to tap into the importance of residency described in the Results and Analysis Section. It is a concrete way in which transition management actors can include car sharing as part of their broader transition work by exploiting strong meanings associated with a related practice (residency).

Valet service

Although Informant 6 lived less than 5 minutes walking distance from the nearest car sharing station, he stated that he would be more likely to use car sharing if he would be able to pick it up and park it closer to his home. This echoes the recommendations for dedicated parking closer to user homes. The informant suggested that the issue of parking could be avoided altogether if the cars could be delivered to or close to the user's home at a designated time. For the user, this would make car sharing more similar to the practice of private car use. It would also require employees of the car sharing firm driving around Oslo, picking up and delivering cars. Traditional car rental companies already offer similar services

7 Conclusion

I will begin this section by answering my research questions. Although they have been addressed, in various ways, throughout the preceding two sections, I will now provide a

summary of my findings for each question. I will then conclude by describing the theoretical and policy implications of my findings.

7.1 Research questions and summary of findings

RQ 1: How does the car sharing relate to other practices for urban households in Oslo?

With regards to other mobility practices, car sharing was just one among many options for the informants in this project. Of these other forms, private car use was the one that car sharing was competing with most directly. Although not all users were satisfied with car sharing as a viable alternative, all informants recognized the challenges and frustrations associated with private car use. Those that decided to own or lease a vehicle do so in spite of the burdens, and expressed an interest in car sharing as a possible option in the future. Walking and cycling were, far and away, the preferred forms of mobility, and ones that did not compete with car sharing. There was virtually no overlap in the types of activities and destinations associated with active transit and car use. Insofar as active transit and car sharing both contribute to the fulfillment of different aspects of user informants' overall mobility needs, the two can be seen as complementary. The relationship between public transit and car sharing was somewhat competitive, but mostly for longer trips outside of the city and the transport of cargo. While car sharing was more expensive and had a high barrier to initial use, it was seen as more flexible and convenient for those who used it. Car sharing and traditional car rental services are in direct competition with one another. Prevalence of use was often determined by price, whereby informants generally preferred car sharing for shorter 1-2 day trips, in and around the metropolitan Oslo area, and rental cars for longer trips.

With regards to auxiliary practices, the ease of parking and the near absence of maintenance give car sharing clear advantages over private car ownership. Parking and maintenance were among the chief burdens associated with private car use and user informants were relieved with having disentangled themselves from these responsibilities.

Shopping is not directly related to car sharing but because it is so tightly wound with automobility, it is relevant from a transition perspective. The rise of home delivery services in Oslo has diminished one of the reasons for owning a car, thereby making it practical to pay for access (to a car) when needed. As with the digital interface for the car sharing apps, the

technology that drives the home delivery apps and websites is potentially complementary to car sharing.

Car sharing is intimately related to household residential practices. In fact, a practitioner's ability to use car sharing is almost entirely dependent on the sort of neighborhood s/he lives in. In neighborhoods where it is available, car sharing potentially facilitates or contributes to urban residency by providing mobility options without the burdens of automobile ownership. The meanings associated with urban residency were more important to the informants than any meanings associated with car sharing. The importance of residency also informs the answer to the second research question.

RQ 2: Why do urban households in Oslo use car sharing services?

Car sharing helps users facilitate the occasional need for a vehicle in an otherwise car-free life. The desire to not own a car was a common sentiment among the informants – even those who owned (or had plans to lease) a car. Despite this disinclination for car ownership, the need or desire to drive did not completely go away. Car sharing provided users with occasional access to a vehicle, without having to fully embrace the logic of automobility. This explanation, while valid, is not a particularly new or interesting insight. The real contribution of this thesis is in contextualizing the desire to live without owning a car with richer descriptions of user experiences. The desire to live without owning a car was part of a larger *project* to live an urban lifestyle that I refer to as urbanism. The preference for living in a dense, walkable, mixed-use, transit-oriented area in the urban core was a driving force in the residential and mobility behavior of the informants. Simply put, the informants used car sharing because it helps them achieve a preferred urban lifestyle.

Despite the importance of urbanism as a *project*, the actual recruitment to the practice of car sharing was often the result of a trigger event, often involving the safety and comfort of a child. In general, price and convenience were reported as being the most important factors when being recruited to the practice. Environmental meaning was not an effective recruitment mechanism, but it became more important as the informants used car sharing more, and served as an effective retention mechanism.

Another key reason why user informants engaged in the practice of car sharing was because they could. By this I mean they had the skills and competences required to be car sharing users. The planning of activities, and especially the operation of the digital interface, are both

skills that distinguish car sharing from private automobile use. Although these skills may not seem extraordinary, it should not be taken for granted that all mobility users possess them.

And finally, the user informants engaged in car sharing because they were generally predisposed to participate in the sharing economy. Sharing gave users a sense of freedom and independence from having to be responsible for owning and maintaining material assets, whether it be a car, a vacation home, or household furniture. Put simply, sharing allowed for freedom from 'stuff'. Furthermore, car sharing and other forms of sharing were laden with environmental meaning, which the informants reported as being somewhat or very important.

7.2 Implications

Theoretical implications

There are two theoretical implications based on the results of this project. In both instances, practice theory offers potential contributions to the study of urban mobility transition from a socio-technical perspective.

Firstly, the differentiation between recruitment and retention mechanism can help regime actors understand the bottom-up micro-phenomena that take place during the process of niche-regime integration. The interviews suggest that environmental meaning associated with car sharing is a poor recruitment mechanism, but a good retention mechanism. This is important because in order for any consumer oriented niche product or service to succeed, new users must be recruited *while* existing ones are maintained. Practice theory's differentiation of recruitment and retention adds a temporal dimension to user adoption, providing a more nuanced and detailed description of the process.

Secondly, the consideration of residency as an important practice related to car sharing has introduced re-urbanization and urbanism as possible landscape forces within the context of the MLP. Re-urbanization has been intensifying in cities throughout the world, and it may be exerting pressure on the dominant rules and practices of the automobility regime. Innovative mobility solutions like car sharing stand to benefit from any windows of opportunity that such landscape pressure brings about. As mentioned earlier, I do not seek to replace the MLP with practice theory but inform the former with the latter. As such, if re-urbanization and urbanism do indeed represent an important landscape force, the micro-level user perspectives and

experiences covered in this project would be effective in informing the more macro-level analysis of mobility transition using the MLP.

Policy implications

There are two policy implications that stem from this thesis. One is related to housing policy and zoning whereas the other is related to the enactment of transition pathways in Oslo.

Firstly, the significance of the meaning associated with residency as a related practice represents an opportunity for policy makers to exploit complementarities between car sharing (as well as other transition oriented mobility solutions) and residential practices. This would require a much deeper understanding of residential practices and lifestyles but examples of such opportunities include: (1) the upscaling of initiatives that integrate (cooperative) housing and car sharing services in inner-city areas; and (2) the expansion of dedicated parking for car sharing in high density residential areas. When appropriate, increases in dedicated parking could be coupled with reductions in minimum parking requirements and similar automobility-oriented zoning practices for new and existing buildings.

Secondly, the informants in this project were overwhelmingly in favor of the reconfiguration pathway (intermodal vision) as compared with the transformation pathway (green car vision). Although informants considered car sharing and electric vehicles to be good for the environment, they repeatedly expressed a greater desire for neighborhoods that are conducive to public and active transit. In other words, they would oppose a green car vision if it increased the number of vehicles on the road, even if it was more environmentally sustainable. Despite using a small and targeted sample, the richness of data collected and the extent and unanimity of the informants' sentiments suggests that they may not be outliers. More research based on representative data is needed, but for now, advocates of electric vehicles and green car pathways should take these results as a warning that any effort to transcend automobility that lead to a greater number of vehicles on the road, albeit cleaner ones, would likely meet resistance. Advocates of integrated pathways and related plans (e.g. *Bilfritt byliv* in Oslo*)* should see these results as a sign of encouragement, but wait for more representative results before celebrating.

List of references

Avis (2017). AvisNow. Retrieved from https://www.avis.no/avisnow

Becker, U. J., Becker, T. & Gerlach, J. (2012). The True Costs of Automobility: External Costs of Cars. Overview on existing estimates in EU-27. *Technische Universität Dresden*. Retrieved from https://stopclimatechange.net/fileadmin/content/documents/move-green/The_true_costs_of_cars_EN.pdf

Bertolini, L. (2007). Evolutionary Urban Transportation Planning: An Exploration. *Environment and Planning A, 39*(8), 1998-2019. doi: 10.1068/a38350

Bijker, W. E., Hughes, T. P. & Pinch, T. (Eds.) (1987). The Social Construction of Technological Systems. Cambridge, MA and London, England: The MIT Press.

Bilkollektivet (2017). About Bilkollektivet. Retrieved from https://bilkollektivet.no/en/about/

Botsman, R. (2012, August 20). Welcome to the new reputation economy. *WIRED*. Retrieved from http://www.wired.co.uk/article/welcome-to-the-new-reputation-economy

Bourke, B. (2014). Positionality: Reflecting on the Research Process. *The Qualitative Report, 19*(33), 1-9. Retrieved from http://nsuworks.nova.edu/tqr/vol19/iss33/3

Bouzarovski, S., Haase, A., Hall, R., Steinführer, A., Kabisch, S., & Ogden, P. E. (2013). Household Structure, Migration Trends, and Residential Preferences in Inner-city León, Spain: Unpacking the Demographies of Reurbanization. *Urban Geography, 31*(2), 211-235. doi: 10.2747/0272-3638.31.2.211

Bradshaw, M. & Stratford, E. (2000). Chapter 3: Qualitative Research Design and Rigour. In I. Hay (Ed.) *Qualitative research methods in human geography* (pp. 37-49). Melbourne: Oxford University Press.

Bulkeley, H., Broto, V. C., Hodson, M. & Marvin, S. (Eds.) (2011). Cities and Low Carbon Transitions. Abingdon and New York: Routledge.

Champion, T. (2001). Urbanization, Suburbanization, Counterurbanization and Reurbanization. In R. Paddison (Ed.), *Handbook of Urban Studies* (pp. 143-159). London: SAGE Publications Ltd. doi: 10.4135/9781848608375.n9

Charmaz, K. (2006). Constructing Grounded Theory: A Practical Guide Through Qualitative Analysis. London: SAGE Publications.

Cook, J., Oreskes, N., Doran, P. T., Anderegg, W. R. L., Verheggen, B., Maibach, E. W., Carlton, J. S., Lewandowsky, S., Skuce, A. G., Green, S. A., Nuccitelli, D., Jacobs, P., Richardson, M., Winkler, B., Painting, R. & Rice, K. (2016). Consensus on consensus: a synthesis of consensus estimates on human-caused global warming. *Environmental Research Letters, 11*(4), 048002. doi: 10.1088/1748-9326/11/4/048002

Corbin, J. & Strauss, A. (1990). Grounded Theory Research: Procedures, Canons and Evaluative Criteria. *Zeitschrift für Soziologie, 19*(6), 418-427.

Couch, C., Fowles, S. & Karecha, J. (2009). Reurbanization and Housing Markets in the Central and Inner Areas of Liverpool. *Planning Practice & Research, 24*(3), 321-341. doi: 10.1080/02697450903020767

Davies, D. & Dodd, J. (2002). Qualitative Research and the Question of Rigor, Qualitative Health Research, 12(2), 279-289. doi: 10.1177/104973230201200211

Davis, B., Dutzik, T. & Baxandall, P. (2012). *Transportation and the New Generation*. [Report by Frontier Group and U.S. PIRG Education Fund]. Retrieved from http://www.uspirg.org/sites/pirg/files/reports/Transportation%20%26%20the%20New%20Generation%20vUS_0.pdf

Davis, K. (1945). The World Demographic Transition. *The Annals of the American Academy of Political and Social Science, 237*, 1-11. Retrieved from http://www.jstor.org/stable/1025490

Dosi, G. (1982). Technological paradigms and technological trajectories. *Research Policy, 11,* 147-162. doi: 10.1016/0048-7333(82)90016-6

Dowling, R. & Simpson, C (2013). 'Shift – the way you move': reconstituting automobility. *Continuum: Journal of Media & Cultural Studies, 27*(3), 421-433. doi: 10.1080/10304312.2013.772111

Dunn, K. (2010). Chapter 6: Interviewing. In I. Hay (Ed.) *Qualitative research methods in human geography* (pp. 101-138). Toronto: Oxford University Press.

England, K. V. L. (1994). Getting Personal: Reflexivity, Positionality, and Feminist Research. *The Professional Geographer, 46*(1), 80-89. doi: 10.1111/j.0033-0124.1994.00080.x

Fagerberg, J. (2004). Chapter 1: Innovation: a guide to the literature, pp1-26. In Fagerberg, J., Mowery, D. C. & Nelson, R. R. (Eds), *The Oxford Handbook of Innovation*. Oxford, UK: Oxford University Press.

Firnkorn, J. & Müller, M. (2015). Free-floating electric carsharing-fleets in smart cities: The dawning of a post-private car era in urban environments? *Environmental Science & Policy, 45,* 30-40. doi: 10.1016/j.envsci.2014.09.005

Geels, F. W. (2002). Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. *Research Policy, 31*, 1257-1274. doi: 10.1016/S0048-7333(02)00062-8

Geels, F. W. (2004). From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory. *Research Policy, 33*, 897-920. doi: 10.1016/j.respol.2004.01.015

Geels, F. W. (2005). Processes and patterns in transitions and system innovations: Refining the co-evolutionary multi-level perspective. *Technological Forecasting & Social Change, 72,* 681-696. doi: 10.1016/j.techfore.2004.08.014

Geels, F. W. (2012). A socio-technical analysis of low-carbon transitions: introducing the multi-level perspective into transport studies. *Journal of Transport Geography, 24*, 417-482. doi: 10.1016/j.jtrangeo.2012.01.021

Geels, F. W. & Schot, J. (2007). Typology of sociotechnical transition pathways. *Research policy, 36,* 399-417. doi: 10.1016/j.respol.2007.01.003

Geels, F. W., Dudley, G., Kemp, R., Lyons, G. (2012). *Automobility in Transition? A Socio-Technical Analysis of Sustainable Transport*. New York and Abingdon: Routledge.

Geels, F. W., Kern, F., Fuchs, G., Hinderer, N., Kungl, G., Mylan, J., Neukirch, M., Wassermann, S. (2016). The enactment of socio-technical transition pathways: A reformulated typology and a comparative multi-level analysis of the German and UK low-carbon electricity transitions (1990-2004). *Research Policy, 45,* 896-913. doi: 10.1016/j.respol.2016.01.2015

Glaser, B. G. & Strauss, A. L. (1967). *The Discovery of Grounded Theory: Strategies for Qualitative Research.* New Brunswick, USA: AldineTransaction.

Golafshani, N. (2003). Understanding Reliability and Validity in Qualitative Research. *The Qualitative Report, 8*(4), 597-606. Retrieved from http://nsuworks.nova.edu/tqr/vol8/iss4/6

Goldwyn, E. (2014, September 4th). The Most Important Transport Innovation of the Decade Is the Smartphone, *Citylab*. Retrieved from https://www.citylab.com/transportation/2014/09/the-most-important-transportation-innovation-of-this-decade-is-the-smartphone/379525/

Gregory, D., Johnston, R., Pratt, G., Watts, M. & Whatmore, S. (Eds.) (2009). *The Dictionary of Human Geography* (5th ed.). Hoboken, New Jersey: Wiley-Blackwell.

Haase, D., Haase, A., Kabisch, S. & Bischoff, P. (2008). Guidelines for the «Perfect Inner City». Discussing the Appropriateness of Monitoring Approaches for Reurbanization. *European Planning Studies, 16*(8), 1075-1100, doi: 10.1080/09654310802315765

Hall, D., Moultak, M. & Lutsey, N. (2017). Electric vehicle capitals of the world. Demonstrating the path to electric drive. The international council on clean transportation (White Paper). Retrieved from: http://www.theicct.org/sites/default/files/publications/Global-EV-Capitals_White-Paper_06032017_vF.pdf

Hamari, J., Sjöklint, M. & Ukkonen, A. (2015). The Sharing Economy: Why People Participate in Collaborative Consumption. *Journal of the Association for Information Science and Technology, 67*(9), 2047-2059. doi: 10.1002/asi.23552

Hawlitschek, F., Teubner, T. & Weinhardt, C. (2016). Trust in the Sharing Economy. *Die Unternehmung – Swiss Journal of Business Research and Practice, 70*(1), 26-44. doi: *10.5771/0042-059X-2016-1-26*

Hodson, M., Geels, F. W. & McMeekin, A. (2017). Reconfiguring Urban Sustainability Transitions, Analysing Multiplicity. *Sustainability, 9*(2), 299. doi: 10.3390/su9020299

Hughes, T. P. (1983). *Networks of Power: Electrification in Western Society 1880-1930*. London and Baltimore: The Johns Hopkins University Press.

Intergovernmental Panel on Climate Change (IPCC) – Fifth Assessment Report (2009). *Chapter 8: Transport, Climate Change 2014: Mitigation of Climate Change*). Retrieved from http://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_chapter8.pdf

Kemp, R., Avelino, F. & Bressers, N. (2011). Transition management as a model for sustainable mobility. *European Transport\Transporti Europei, 47,* 25-46. URL: http://hdl.handle.net/10077/6172

Kemp, R., Geels, F. & Dudley, G. (2012). Introduction: Sustainability Transitions in the Automobility Regime and the Need for a New Perspective, pp 3-28. In F.W. Geels, R. Kemp, G. Dudley, G. Lyons (Eds.), *Automobility in Transition? A socio-technical analysis of sustainable transport*. New York and Abingdon: Routledge.

Kent, J. L. & Dowling, R. (2013). Puncturing automobility? Carsharing practices. *Journal of Transport Geography, 32*, 86-92. doi: 10.1016/j.jtrangeo.2013.08.014

Kingsley, D. & Urry, J. (2009). *After the Car*. Cambridge, UK: Polity Press.

Kulu, H. & Boyle, P. J. (2007). High fertility in city suburbs. Compositional or contextual effects? MPIDR Working Paper WP 2007-034, Max Planck Institute for Demographic Research. Retrieved from http://www.demogr.mpg.de/papers/working/wp-2007-034.pdf

Lachman, D. A. (2013). A survey and review of approaches to study transitions. *Energy Policy, 58*, 269-276. doi: 10.1016/j.enpol.2013.03.013

Lanzendorf, M. (2010). Key Events and Their Effect on Mobility Biographies: The Case of Childbirth. *International Journal of Sustainable Transportation, 4*(5)*,* 272 – 292. doi: 10.1080/15568310903145188

Lessig, L. (2008). *Remix: Making Art and Commerce Thrive in the Hybrid Economy*. London, UK: Bloomsbury Academic.

Lincoln, Y. S. & Guba, E. G. (1985). Naturalistic Inquiry. Newbury Park, CA: SAGE Publications.

Logan, S. (2015). Modernist Urbanism in the Age of Automobility: Producing Space in the Suburbs of Toronto and Prague (Doctoral dissertation). York University. Retrieved from: https://yorkspace.library.yorku.ca/xmlui/handle/10315/30686

Loorbach, D. (2007). *Transition Management: New mode of governance for sustainable development.* Utrecht, Netherlands: International Books.

Løken, A. & Eggesvik, O. (2016, July 3). Rundt 1800 parkeringsplasser skal fjernes i Oslo de neste årene. *Aftenposten*. Retrieved from https://www.aftenposten.no/osloby/Rundt-1800-parkeringsplasser-skal-fjernes-i-Oslo-de-neste-arene-585893b.html

Markard, J., Raven, R. & Truffer, B. (2012). Sustainability transitions: An emerging field of research and its prospects. *Research Policy, 41*, 955-967. doi: dx.doi.org/10.1016/j.respol.2012.02.013

Marsden, G. & Rye, T. (2010). The governance of transport and climate change. *Journal of Transport Geography, 18*(6), 669–678. doi: 10.1016/j.jtrangeo.2009.09.014

Martin, E. & Shaheen, S. (2011). The Impact of Carsharing on Public Transit and Non-Motorized Travel. An Exploration of North American Carsharing Survey Data. *Energies, 4,* 2094-2114; doi: 10.3390/en4112094

Martin, E. & Shaheen, S. (2016). Impacts of Car2Go on vehicle ownership, modal shift, vehicle miles traveled, and greenhouse gas emissions: An analysis of five North American cities. Working paper, Transportation Sustainability Research Center. Retrieved from: http://innovativemobility.org/wp-content/uploads/2016/07/Impactsofcar2go_FiveCities_2016.pdf

Mega, V. P. (2016). *Conscious Coastal Cities: Sustainability, Blue Green Growth, and The Politics of Imagination*. Switzerland: Springer International Publishing. doi: 10.1007/978-3-319-20218-1

Michielin, F., Mulder & C. H., Zorlu, A. (2008). Distance to parents and geographical mobility. *Population, Space and Place, 14*(4), 327-345. doi: 10.1002/psp.509

Miles, M. B. & Huberman, A. M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook*. Thousand Oaks: SAGE Publications.

Nelson, R. R. & Winter, S. G. (1977). In search of useful theory of innovation. *Research Policy, 6,* 36-76. doi: 10.1016/0048-7333(93)90053-K.

Millard-Ball, A., Murray, G., Schure, J. T., Fox, C. & Burkhardt, J. (2005). *Car-Sharing: Where and How It Succeeds.* Transit Cooperative Research Program (TCRP Report 108). Retrieved from http://www.communauto.com/images/tcrp_rpt_108.pdf

Nordbakke, S., Sagberg, F. & Gregersen, F. (2016). Slutt på lidenskapen? Endringer i førerkortandel og bilbruk blant ungdom [*The end of passion? Changes in driving license rate and driving rate among young people]*. (TØI Report 1477/2016). Retrieved from https://www.toi.no/publikasjoner/slutt-pa-lidenskapen-endringer-i-forerkortandel-og-utvikling-blant-ungdom-article33823-8.html

Norwegian Automobile Federation [Norges Automobil-Forbund] (2016). Fakta om avgifter på drivstoff i Norge. [Facts about fuel taxes in Norway]. Retrieved from https://www.naf.no/tips-og-rad/okonomi-og-avgifter/avgifter/fakta-om-drivstoffavgifter/

Norwegian Electric Vehicle Association [Norsk elbilforening] (2016). *Elbilbestand* [Electric vehicle stock] [Fact sheet]. Retrieved from https://elbil.no/elbilstatistikk/elbilbestand/

Norwegian Ministry of Finance [Finansdepartementet] (2017). Avgiftssatser [Tax rates] 2017. Retrieved from https://www.regjeringen.no/no/tema/okonomi-og-budsjett/skatter-og-avgifter/avgiftssatser-2017/id2514838/

Norwegian. Ministry of Transport and Communications [Samferdselsdepartementet] (2017). *Nasjonal transportplan 2018-2029* [National Transport Plan] (Meld. St. 33). Retrieved from https://www.regjeringen.no/contentassets/7c52fd2938ca42209e4286fe86bb28bd/no/pdfs/stm201620170033000dddpdfs.pdf

Norwegian Tax Administration [Skatteetaten] (2017a). Årsavgift [Annual Fee]. Retrieved from http://www.skatteetaten.no/no/Tabeller-og-satser/arsavgift/

Norwegian Tax Administration [Skatteetaten] (2017b). Bilsatser – firmabil [Vehicle rates – company vehicles]. Retrieved from http://www.skatteetaten.no/no/Tabeller-og-satser/Bilsatser---firmabil/

Nymo, J. & Ingebrethsen, C. (2015, May 27). Ni av ti tiåringer har egen smarttelefon [Nine out of ten ten-year-olds have their own smartphone]. *Norsk Rikskringkasting (NRK)*. Retrieved from https://www.nrk.no/kultur/ni-av-ti-tiaringer-har-egen-smarttelefon-1.12474080

Örebrobostäder (2017). EKObil. [Eco car]. Retrieved from http://www.obo.se/sv/For-vara-hyresgaster/Ekobil/

Oslo Bysykkel (2017). Om Oslo Bysykkel. [About Oslo City Bike] Retrieved from https://oslobysykkel.no/om-bysykkel

Oslo Municipality [Oslo Kommune] (2015). Kommuneplan 2015: Oslo mot 2030. [Municipal Plan 2015: Oslo towards 2030]. Retrieved from https://www.oslo.kommune.no/getfile.php/1374699/Innhold/Politikk%20og%20administrasjon/Politikk/Kommuneplan/Ny%20kommuneplan%202015/Kommuneplan%202015%20del%201%20justert%2031.01.2017.pdf

Oslo Municipality [Oslo Kommune] (2017a). The Electric Vehicle Capital of the World. Retrieved from: https://www.oslo.kommune.no/english/politics-and-administration/green-oslo/best-practices/the-electric-vehicle-capital-of-the-world/

Oslo Municipality [Oslo Kommune] (2017b). Car free city life in Oslo. Retrieved from https://www.oslo.kommune.no/english/politics-and-administration/green-oslo/best-practices/car-free-city/

Oslo Municipality [Oslo Kommune] (2017c). The Toll Ring. Retrieved from https://www.oslo.kommune.no/english/politics-and-administration/green-oslo/best-practices/the-toll-ring/

Oslo Municipality [Oslo Kommune] (2017d). Folkemengde og endringer [Population and changes]. Retrieved from https://www.oslo.kommune.no/politikk-og-administrasjon/statistikk/befolkning/folkemengde-og-endringer/

Oslo Municipality & Akershus County Council [Oslo Kommune & Akershus Fylkeskommune] (2015). Regional plan for areal og transport i Oslo og Akershus [Regional plan for land use and transportation in Oslo and Akershus]. Retrieved from: https://www.oslo.kommune.no/getfile.php/13114975/Innhold/Plan%2C%20bygg%20og%20eiendom/Overordnede%20planer/Regional%20plan%20for%20areal%20og%20transport%20i%20Oslo%20og%20Akershus.pdf

Pantzar, M. & Shove, E. (2010). Understanding innovation in practice: a discussion of the production and re-production of Nordic Walking. *Technology Analysis & Strategic Management, 22*, 4, 447-461. doi: 10.1080/09537321003714402

Pedersen, R. (2014). Staten tar 60 prosent av drivstoffprisen. *Side3*. Retrieved from http://www.side3.no/motor/staten-tar-60-prosent-av-drivstoffprisen/8466656.html

Punch, K. F. (2005). *Introduction to Social Research: Quantitative and Qualitative Approaches*. London, UK: SAGE Publications.

Puschmann, T. & Alt, R. (2016). Sharing Economy. *Business & Information Systems Engineering, 58*(1), 93-99. Retrieved from http://aisel.aisnet.org/bise/vol58/iss1/9/

Reckwitz, A. (2002). Toward a Theory of Social Practices: A Development in Culturalist Theorizing. *European Journal of Social Theory, 5,* 243-263. doi: 10.1177/13684310222225432

Rérat, P. (2011). The New Demographic Growth of Cities. *Urban Studies, 49*(5), 1107-1125. doi: 10.1177/0042098011408935

Rip, A. & Kemp, R. (1997). Chapter 6: Technological change, pp. 327 – 399. In: Rayner, S. & Malone, E.L. (Eds.) *Human choice and climate change. Vol. II, Resources and technology*. Columbus, OH: Battelle Press.

Rosenberg, N. (1976). *Perspectives on Technology*. Cambridge, UK: Cambridge University Press

Rotmans, J., Kemp, R. & van Asselt, M. (2001). More evolution than revolution: transition management in public policy. *Foresight, 3*, 1*,* 15-31. doi: 10.1108/14636680110803003

Rygnestad, L. (2014). Fortetting: et intervju med Jon Guttu. *Bytopia*. Retrieved from: http://bytopia.no/utgave/omstilling/fortetting-et-intervju-med-jon-guttu/

Røed, L. (2016, February 2016). Lager åtte nye byruter for sykkel. *ByplanOslo*. Retrieved from http://byplanoslo.no/content/lager-atte-nye-byruter-sykkel

Røpke, I. & Christensen, T. H. (2012). Energy impacts of ICT – Insights from an everyday life perspective. *Telematics and Informatics, 29,* 348-361, doi: 10.1016/j.tele.2012.02.001

Schippl, J., Gudmundsson, H., Sørensen, C. H., Anderton, K., Brand, R., Leiren, M. D. & Reichenbach, M., (2016). Different Pathways for Achieving Cleaner Urban Areas: A Roadmap towards the White Paper Goal for Urban Transport. *Transportation Research Procedia, 14,* 2604 – 2613. doi: 10.1016/j.trpro.2016.05.413

Schwanen, T., Banister, D. & Anable, J. (2011). Scientific research about climate change mitigation in transport: A critical review. *Transportation Research Part A, 45*, 993-1006. doi: 10.1016/j.tra.2011.09.005

Seale, C. (1999). Quality in Qualitative Research. *Qualitative Enquiry, 5*(4), 465-478. doi: 10.1177/107780049900500402

Shaheen, S., Sperling, D. & Wagner, C. (1998). Carsharing in Europe and North America: Past, Present and Future. *Transportation Quarterly, 52*(3), 35-52. Retrieved from http://escholarship.org/uc/item/4gx4m05b

Shaheen, S., Sperling, D. & Wagner, C. (1999). A Short History of Carsharing in the 90's. *The Journal of World Transport Policy and Practice, 5*(3). 18-40. Retrieved from http://tsrc.berkeley.edu/node/457

Shaheen, S. & Cohen, A. P. (2013). Carsharing and Personal Vehicle Services: Worldwide Market Development and Emerging Trends. *International Journal of Sustainable Transportation, 7*(1)*,* 5-34, doi: 10.1080/15568318.2012.660103

Shared Use Mobility Center (2015). Reference Guide. Retrieved from http://sharedusemobilitycenter.org/wp-content/uploads/2016/10/Reference-Guide-Editsweb-version-10.24.2016.pdf

Shared Use Mobility Center (2017). What is Shared-Use Mobility? Retrieved from http://sharedusemobilitycenter.org/what-is-shared-mobility/

Sheller, M. & Urry, J. (2000). The City and the Car. *International Journal of Urban and Regional Research, 24*, 4, 737-757. doi: 10.1111/1468-2427.00276

Singh, K. (2007). *Quantitative social research methods*. New Delhi, India: Sage Publications.

Shove, E. & Pantzar, M. (2007). Recruitment and Reproduction: The Careers and Carriers of Digital Photography and Floorball. *Human Affairs, 17*(2), 154-167. doi: 10.2478/v10023-007-0014-9

Shove, E. & Walker, G. (2007). Caution! Transitions Ahead: Politics, Practice, and Sustainable Transition Management. *Environment and Planning A, 39,* 763-770. doi: 10.1068/a39310

Shove, E. & Walker, G. (2010). Governing transitions in the sustainability of everyday life. *Research Policy, 39,* 4, 471-476. doi: 10.1016/j.respol.2010.01.019

Smith, A., Stirling, A. & Berkhout, F. (2005). The governance of sustainable socio-technical transitions. *Research Policy, 34*, 1491-1510. doi: 10.1016/j.respol.2005.07.005

Southerton, D. & Watson, M. (2015, 25th of November). Multi-Level Perspective and Theories of Practice: a mistaken controversy? *Mobile Lives Forum*. Retrieved from http://en.forumviesmobiles.org/arguing/2015/11/25/multi-level-perspective-and-theories-practice-mistaken-controversy-2972

Sperling, D. & Gordon, D. (2008). Two Billion Cars. Transforming a Culture. *TR News 259*. Retrieved from http://onlinepubs.trb.org/onlinepubs/trnews/trnews259billioncars.pdf

Statistisk Sentralbyrå (SSB) (2016). Registrerte kjøretøy, 2015 [Registered vehicles, 2015] [Fact sheet]. Retrieved from https://www.ssb.no/transport-og-reiseliv/statistikker/bilreg/aar/2016-03-30

Stenbacka, C. (2001). Qualitative research requires quality concepts of its own. *Management Decisions, 39*(7), 551-556. doi: 10.1108/EUM0000000005801

Strauss, A. L. & Corbin, J. M. (1990). *Basics of qualitative research: grounded theory procedures and techniques*. Newbury Park, CA: Sage Publications.

Thomas, G. (2011). A Typology for the Case Study in Social Science Following a Review of Definition, Discourse, and Structure. *Qualitative Inquiry, 17*(6), 511-521. doi: 10.1177/1077800411409884

Truffer, B. (2003). User-led Innovation Processes: The development of Professional Car Sharing by Environmentally Concerned Citizens. *Innovation: The European Journal of Social Science Research, 16*(2), 139-154. doi: 10.1080/13511610304517

Tønnesen, A., Meyer, S. F., Skartland, E. & Sundfør, H. B. (2016). Europeiske byer med bilfrie sentrum [*European cities with car-free city centres]* (TØI report 1476/2016). Retrieved from: https://www.toi.no/getfile.php?mmfileid=42371

United Nations (2016). *Global Sustainable Transport Conference*. [Press release]. Retrieved from https://sustainabledevelopment.un.org/content/documents/11979Final_Press_Release.pdf

United Nations Center for Human Settlements (UN-Habitat) (2001). *The Role of Urban Transport in Sustainable Human Settlements Development*. (Background Paper no. 7. Commission on Sustainable Development, Ninth Session, 16-27 April 2001). Retrieved from http://www.un.org/esa/sustdev/csd/csd9_bp7.pdf

United Nations Statistics Division (2017). *Population density and urbanization*. (Standards and Measures). Retrieved from: https://unstats.un.org/unsd/demographic/sconcerns/densurb/densurbmethods.htm

Urry, John (2004). The 'System' of Automobility. *Theory, Culture and Society, 21*(4/5), 25-39. doi: 10.1177/0263276404046059

Van Der Pas, J-W. (2014). Oslo: electric vehicle capital of the world (Norway). *Eltis: The urban mobility observatory.* Retrieved from: http://www.eltis.org/discover/case-studies/oslo-electric-vehicle-capital-world-norway

Walsh, I., Holton, J. A., Bailyn, L., Fernandez, W., Levina, N. & Glaser, B. (2015). What Grounded Theory Is … A Critically Reflective Conversation Among Scholars. *Organizational Research Methods, 18*(4), 581-599. doi: 10.1177/1094428114565028

Watson, M. (2012). How theories of practice can inform transition to a decarbonized transport system. *Journal of Transport Geography, 24,* 488-496. doi: 10.1016/j.jtrangeo.2012.04.002

Winchester, H. P. M. & Rofe, M. W. (2010). Qualitative Research and its Place in Human Geography. In I. Hay (Ed.) *Qualitative Research Methods in Human Geography*, pp. 3-24. Toronto: Oxford University Press.

Winstanley, A., Thorns, D. C., Perkins, H. C. (2002). Moving House, Creating Home: Exploring Residential Mobility. *Housing Studies, 17*(6), 813-832. doi: 10.1080/02673030216000

World Health Organization (WHO) (2015). Global Health Observatory data: Registered vehicles. Retrieved from http://apps.who.int/gho/data/node.main.A995

World Health Organization (2016). Road traffic injuries [Fact sheet]. Retrieved from http://www.who.int/mediacentre/factsheets/fs358/en/

World Health Organization (2017). Global Health Observatory data: Top 10 causes of death. Retrieved from http://www.who.int/gho/mortality_burden_disease/causes_death/top_10/en/

Appendix 1: Interview guide

Day-today mobility	• Can you describe your household travel patterns for a typical day (e.g. yesterday) • Do you have other travel options that you could use regularly? • Recent changes in your travel behavior/patterns • How do you decide on how you travel? • Practical concerns (parking, traffic, safety) • Expenses (car, maintenance, fuel, parking, toll, insurance, Ruter)
Non-routine mobility	• Travel patterns for holidays: short vs. long • Travel patterns for errands and leisure (day) trips • Short trips related to work? • Shopping (non-routing) with CS and shopping without. • Do you visit people more or less often as a CS user?
Car sharing use	• When did you start using car sharing? • Did CS affect your decision to own or not own a car? • Do you see CS or your current behavior as temporary or long term? • In general, how do you **feel** about CS? • How and why do you use CS? • Are you aware of other CS options? • Dis CS affect your amount of walking, biking or use of PT? • Do you prefer one business model over the others (B2P, coop, P2P)? • Are there any policies, programs or incentives that could make you use it (more)? E.g. dedicated parking, collective lanes, direct subsidies, bom.
Big Picture	• Chicken egg – does your travel plans determine your mode of transport or do your available modes of transport determine your travel plans? • Mobility biography: reverse chronological timeline with life stages and triggers • Environmental, economic and social factors.
Other	• Underlying attitudes/motivations for using CS • How often do you discuss CS in social settings? • Would you consider moving residences to a place that required car ownership? • Would you be OK with more cars on the road if they were cleaner? • Do you engage in other types of sharing?