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Analysing car-sharing and variations between practices within the mobility nexus in Gothenburg.

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Abstract

Previous studies have shown that access-based consumption is becoming more popular amongst consumers. However, data suggests that still a small proportion of consumer are taking advantage of car-sharing services. In recent years, several studies have examined car-sharing through the lens of practice theory, however the phenomena have not been explored in relation to shared elements intersecting with associated practices and establishing variations between practices.

This study examined car-sharing in connection with its related practices (residing, shopping/errands, commute and leisure) and identified overlaps of shared elements in various forms and combinations, as well as analysed various understanding from the practitioner's standpoint and varying strength of links between practices. Results indicated that shopping/running errands and residing are closely connected with car-sharing, making their performance with car-sharing seamless. In contrast, commuting and leisure practices are not well connected with car-sharing making them inconvenient and problematic for practitioner to perform in combination with car-sharing. The use of practice theory and variations analysis approach allowed to pinpoint how car-sharing needs to be improved to better connect with its related practices.

Key words: car-sharing, practice theory, variations, elements of practice, practitioner

Introduction

According to reports there are more than 1 billion passenger cars around the globe, which are estimated to reach 2.8 billion by 2050 (Mayer, Kaniovski & Sheffran, 2012). The high adoption of automobiles has resulted in negative environmental costs such as climate change, waste and pollution (Aamaas, Borken-Kleefel & Peters, 2013; Baptista, Melo & Rolim, 2014). Social costs are also present particularly, where people require automobiles for essential activities that could lead to isolation of minority groups such as the unemployed, elderly, handicapped, children and others (Hine & Grieco, 2003). The increasing use of cars has transformed not only the natural, but also the built environment and urban life (Firnkorner & Muller, 2015). It has changed the way people commute to work (Garcia-Palomares, 2010), how they shop

(Reimers, 2013) and has led to dispersion of the urban landscape. As a result, urban areas suffer from air and noise pollution, congestion, parking shortage and land usage for parking and highway mileage (Damert & Baumgartner, 2017; Loukopoulos et al. 2005). In Sweden alone, transport is responsible for one third of the country's greenhouse gas emissions (Government office of Sweden, 2017), where the Swedish Transportation Administration reported that the average carbon dioxide emissions from cars increased in 2018 (The Local, 2019).

Two types of strategies have been taken to minimise these issues. On one side, there has been a focus on technology, improving vehicle's performance or using more environmentally friendly energy sources such as hydrogen fuel or electricity, to reduce CO₂ emissions (Baptista et al. 2012).

On the other side, the usage of alternative mobility such as car-sharing has been encouraged to reach a more effective transportation system (Baptista et al., 2014). In this study, the authors focus on the second approach by analysing car-sharing services in Gothenburg, Sweden.

Car-sharing

Car-sharing is a membership-based service that gives access to an automobile for short-term daily use. It is one of the most popular access-based consumption mode in urban areas that contributes to sustainable mobility (Ferrero et al., 2018). Access-based consumption (ABC) can be defined as an access to a product or a service for a fee without the need to own it (Bardhi & Eckhard, 2012). The advantage of car-sharing for users is having access to a car when they need it without ownership (Martin, Shaheen & Lidicker, 2010). The cars owned by the car-sharing companies are distributed at a series of locations usually in the centre of the city and in proximity to transportation hubs (subways, train stations). In most cases there is a membership fee that allows to reserve a vehicle at any time and a usage fee accumulated by the duration and distance travelled (Baptista et al., 2014; Martin et al., 2010). Depending on the provider, the membership could include fees such as insurance, fuel, parking, cleaning and maintenance (Baptista et al., 2014). Three types of car-sharing could be identified based on their mode (Ferrero, et al. 2018). Firstly, two-way car-sharing provides predefined parking spaces, where the users must pick-up and return the vehicle from the same place (Nourinejad & Roorda, 2015). Secondly, one-way car-sharing is more flexible, where users can return the vehicle at a different predefined parking spot, and not necessarily the same as the starting point (Ibid). Lastly, in a free-floating car-sharing scheme, users are allowed to park the vehicles in public spaces within the radius of the operational

area of the company (Firnborn & Muller, 2011).

Benefits of car-sharing

Various studies share the benefits of car-sharing schemes. For instance, reports from the European Union suggest that one car-sharing vehicle can be a substitute for eight conventional cars (Loose, 2010). Car-sharing leads to usage of multimodal sustainable transportation and less kilometres driven by cars, reduction of car trips and numbers of car per household in urban areas (Nobis, 2006) even when considering the rebound effect of people, who did not own a car and started driving (Martin & Shaheen, 2011). The access-based consumption model of car-sharing gives consumers the possibility to be more environmentally friendly, as the products are being used more frequently from multiple individuals, maximising the usage of the vehicle, compared to ownership (Botsman & Rogers in Lawson, et al. 2016). With car-sharing, vehicles spent less time idle, otherwise the average car is parked for 90% of the time (Shoup, 2005). As a result, car-sharing leads to fewer parking spaces needed, which are expensive for cities (Ibid). Moreover, members of car-sharing services, are benefited by reduction in travel cost due to the lack of vehicle related expenditure like insurance and maintenance (Barth & Shaheen, 2002). The service also gives access to locations that are otherwise difficult to reach by other transports such as public transportation, walking and biking (Ferrero et al., 2018). Car-sharing has also been reported to contribute sustainable city by reducing air pollution and energy use, when the fleet of cars is fuel efficient, electric or hybrid (Barth & Shaheen, 2002; Martin & Shaheen, 2011).

Research rationale

Scholars have been investigating access-based services and car-sharing, however, there is still a gap between the literature and the development of the market, especially when the revenues earned by companies is

lower compared with the capital in use (Ferrero et al., 2018). Car-sharing is still a niche product with only a small proportion of people taking advantage of the service (Nobis, 2006). For instance, market reports from Germany show lack of demand, where one-third of German customers are potential members of car-sharing service, but in reality only 2.5% actually use the service (McKinsey & Co. 2012). Similarly, in Sweden Car2go closed down operations in Stockholm as there were a small amount of users and the company was placed in an unsustainable economic situation due to high parking fees and congestion taxes (Jelica, 2018). Car-sharing service Drivenow, also closed down operations in Stockholm 2018, due to low employment and disagreements with local authorities regarding parking (Ibid). Data from 2009 showed that in Sweden the number of members was only 14,889, with 37 cities offering the service (Loose, 2010). All mentioned above, suggests that it is important to get a richer understanding of why car-sharing has not been able to gain much popularity amongst consumers in Sweden. Thus, in this study the authors conducted a critical examination of car-sharing in Gothenburg.

Research Gap

Due to the growth of car-sharing services over the years, the academic community has published a number of papers on the topic. Some of them focus on technical and modelling aspects (Jorge & Correia, 2013; Laporte, Meunier & Wolfler Calvo, 2015), while others have identified consumer motivations to use car-sharing (Schaeffers, 2013; Habib et al. 2012) and factors affecting the adaptation of electric car-sharing systems (Costain, Ardron & Habib, 2012).

Several studies have used social practice based frameworks to analyse car-sharing (Kent & Dowling, 2013; Dowling & Kent, 2015; George, 2018). Practices can be explained as “heterogeneous configurations” comprised of various

elements including skills and competencies (driving), materials (technologies and infrastructure), and meanings (freedom) (Higginson, Hargreaves & McKenna, 2015, p.951; Kent & Dowling, 2013).

Higginson et al., (2015) explain that everyday life consists of multiple interconnected and bundled social practices, that are co-located in time and space through their shared elements. As an everyday practice, car-sharing is also interconnected with other daily practices (Kent & Dowling, 2013). Some studies have considered the connection of car-sharing with other practices. For example, George (2018) discusses car-sharing relation to other mobility practices (car ownership, walking, cycling, public transit) and auxiliary practices (parking, car maintenance) as well as shopping and residing. Similarly, Kent and Dowling (2013) provide a brief discussion on how car-sharing is bundled spatially with other practices such as working, visiting, parenting and consuming. Their study also discusses the temporal challenges of car-sharing and how associated practices need to be synchronised in time for the service to work successfully (Ibid). These studies provided some insights on car-sharing and how it bundles with other practices, however the analyses merely touched upon the topic. Thus, a deeper understanding of how car-sharing is connected to other practices is needed in order to understand how these connections impact the service.

To address this gap we use practice theory to examine how car-sharing is connected with its related practices and exist as part of a system, also referred to as nexus of practices (Hui, 2017). Related practices could be connected through overlaps and communalities of shared material or non-material elements, also known as intersections (Ibid).

Hui (2017) argues that investigating the material and practitioners’ intersections between practices, would give an

understanding about the interdependencies of varying strengths, patterning and density of the material links between practices. To identify the intersections of car-sharing and associated practices, we untangle the elements that constitute car-sharing and use Hui's (2017) approach to explore which elements overlap with other practices. However, we examine not only material links between practices, but also extend Hui's approach to the other elements of practice including skills and meanings and their links. This would give an insight about the varying strength of links between practices (Hui, 2017) different combinations of elements (Higginson, et al., 2015) as well as elements taking varying meanings in different practices (Star and Griesemer, 1989). These differences, indicate *variations between practices*, which could be used to examine the consequences of the variations in the paths of the practices and the nexus they form (Hui, 2017; Higginson et al., 2015, source). In other words, the study contributes by exploring the degree to which car-sharing is connected with other practices, through what combinations of elements, and how the connections could be strengthened to increase the growth of the service.

Although, several studies have examined the variations *within* a practice (Higginson et al., 2015; Koroschetz, 2019) to the authors best knowledge no research has analysed the variations *between* practices in the context of car-sharing. By using practice theory this study addresses this gap and argues that car-sharing and practices related to car-sharing are connected and have variations. In turn, by exploring the variations between practices, we provide a better understanding on how car-sharing elements influence the connection with other practices and how variations impact car-sharing. We further discuss how this knowledge can be used to enhance weak links to improve the car-sharing service to

fit consumers' needs. The aim and research questions of our study are the following:

Aim: To analyse how car-sharing practices can be better connected with associated practices and contribute to the growth of car-sharing usage.

Research Questions:

1. *How elements of car-sharing as a practice intersect and establish variations with other associated daily practices?*
2. *How car-sharing can be improved to establish stronger links with other connected practices?*

The paper starts with introducing social practice theory in the context of car-sharing, where some of the main concepts are explained. It then continues with an application of the practice theory notion of connected and bundled practices in the context of car-sharing. In other words, the authors argue, which social daily practices have connections with car-sharing and the nature of their links. The study then goes into in-depth discussion about Hui's (2017) approach to identify overlapping material elements between practices and how this is used to discover variations between practices. To collect the empirical data, which the analysis was based on, a series of in-depth interviews were conducted, which is described in the method section. This is followed by an analysis and evaluation of the connections between practices and their intersecting elements. Finally, the authors discuss the relevance of the findings and the practical implication for car-sharing as well as theoretical contribution of the study.

Literature review

Car-sharing through practice theory

Practice theory has been applied in relation to sharing economy (Hazee, Delcourt & Van Vaerenbergh 2017; Herbert & Collin-Lachaud, 2017), new types of transport adaptation (Watson, 2012), and car-sharing

(Kent & Dowling, 2013; Dowling & Kent, 2015; George, 2018; Priya Uteng, Julsrud, George, 2019). This is due to practice theory approach allowing to evaluate platforms as service providers, how they enable the interaction between individuals and how their practices influence each other (Guyader, 2018).

The notion of practices involves material objects and human interaction (Kjellberg & Helgesson, 2007). Practice is a routine behavior that is built from interconnected elements that do not stand alone and include processes such as movements, cognitive processes, previous knowledge and object utilization (Reckwitz, 2002, p.249,250).

The constitutive elements of practices as defined by Pantzar & Shove (2010) include materials, skills and meanings (p.458). When one performs a practice, individuals connect the elements that form the practice. In their example of skateboarding practice, Shove, Pantzar & Watson (2012) describe that materials can include street spaces and skateboards, skills could be board riding competence and meanings behind the sport such as being rebellious. All of this forms skateboarding practice as entity.

According to Schatzki (2002), there is a difference between practices as entities and practices as performance. For instance, practices as entities are established even if practices are not in active mode. The performance activates the practice, where elements begin to link, thus a given “pattern” from the practice-as-an-entity is filled out and duplicated (Shove et al., 2012, p.7). The integration of three elements and their performance allows for practices to be realized, secured and transformed (Higginson, Hargreaves & Mckenna, 2015). Furthermore, the practitioner is dispersed across, rather than within the elements at hand (Ibid). In our study we define car-sharing as-an-entity that exist within space and time. It is performed by an agent through connecting

elements in a particular way, making car-sharing come to “life” (Ibid).

Elements of car-sharing

According to Dowling & Kent (2015), car-sharing can be viewed as complex creations of integrated ‘elements’ mentioned above. For example, in car-sharing practice, *materials* that are employed by the practitioner include infrastructure, car itself, cargo (Kent & Dowling, 2013), built environment (Bergmaier et al., 2004), child car seats and material environment such as weather, spatial proximity and local geography (George, 2018). For car-sharing to be successful, scholars have described the need for a specific built environment including densely populated metropolitan areas that lack parking space, well-functioning public transport system (Bergmaier et al., 2004), option for walking and biking (Huwer, 2004), as well as limited usage of private car due to city regulations and restrictions (Cohen, Shaheen, McKenzie, 2008). Moreover, materials such as automated technologies have become crucial for the success of car-sharing and due to the advancement of technology, users are being able to use the service much easier and more efficiently (Kent & Dowling, 2013).

Most of the *skills* required to perform car-sharing are transferred from other practices (Kent & Dowling, 2013). For example, the online interface of car-sharing such as website and mobile application are similar to other online platforms. Similarly, the skills of driving and navigating roads and their rules, are already existing for driving-license holders. However, a known skill of time management, requires more competence in car-sharing when it comes to organising and planning travel in advance. (Ibid)

For young people the *meaning* of the car as an object has shifted over the decades. The meaning is moving away from symbolism, which is based on freedom, youthfulness

and autonomy. Studies show the meaning of being progressive is changing towards use of smartphones, social media and alternative modes of transportation (Dowling & Simpson, 2013). Additionally, the meaning of “freedom” tends to be associated with the possibility to use a car, without having the burden to own and commit to it (Kent & Dowling, 2013; Bardhi & Eckhardt, 2012).

Car-sharing and Connected practices

Various practices could be connected and in some cases can shape one another (Shove et al., 2012). Shove et al. (2012) argues that the links between practices have a crucial impact on individual practices, the elements they are constituted of, as well as the spatial and temporal setting of people’s daily lives. To understand the relationship between practices, it is important to define what type of link they share (Ibid). Bundles are more loosely connected practices that are usually connected based on location or coexistence (Ibid). For instance, cooking, preparing food, eating and socialising are bundled together due to their co-location in kitchen-diners (Ibid). On the other hand, complexes are tightly linked practices that could be interdependent and could form a new entity (Shove et al. 2012; Pantzar & Shove, 2010). For example, the practices of completing forms, taking passport photos, handing over documentation and biometric measures, shapes a complex practice of getting a passport (Hui, 2017).

Several studies that investigated car-sharing reported that shopping (Huyer, 2004; Burkhardt & Millard-Ball, 2006) and recreational and social trips (Burkhardt & Millard-Ball, 2006; Costain et al., 2012) such as visiting friends (Clavel, Mariotto & Enoch, 2009) as well as personal business (Burkhardt & Millard-Ball, 2006) are the main purposes for car-sharing usage. In the same way, many studies report that car-sharing is heavily dependent on the residing location of potential users, where highly dense urban areas are favourable for the

service (Bergmaier et al. 2004; Stillwater et al., 2009). Other car-sharing usage purposes, which have been identified as not that common include work-related trips and trips to and from work (Burkhardt & Millard-Ball, 2006; Ye et al. in press).

In line with Shove et al. (2012) we define practices to be “whatever actual and potential practitioners recognize as such” (p.82). Based on previous research on car-sharing and using Shove’s definition we define shopping, commuting, residing and leisure activities as four different practices. Furthermore, in the following sections we argue that these four practices are connected to car-sharing.

Mobility practices and shopping practices have been co-evolving, where households have started conducting a single grocery shopping trip to one destination often in the outskirts of cities (Watson, 2012). As a result, car-sharing and shopping practices have been performed together more frequently (Huyer, 2004; Burkhardt & Millard-Ball, 2006), suggesting their connection. Similarly, car-sharing has often been linked to leisure practices, such as recreational and social trips including visiting friends and conducting personal business (Burkhardt & Millard-Ball, 2006). Although, some studies have not found a strong link between car-sharing and commuting (Burkhardt & Millard-Ball, 2006), others have reported a very close connection (Ye et al. in press). A study in Shanghai reported that car-sharing was used to commute to work and back to home especially in areas where there was limited access to public transportation (Ibid). Although, this study was conducted in Asia, where cities and mobility practices as well as the availability of public transportation varies compared to Europe and particularly Sweden, this study argued that there is a connection between the two practices.

Shove et al. (2012) suggest that the spatial proximity, where different practices are

performed, is not the only way spatial arrangements could connect practices. In fact, practices can be connected due to the mere co-location of their material elements, however, that does not mean that co-located elements result in multiple practices influencing one another. Also practices that share the same meaning elements can happen in the same location without influencing one another. It is important to point out, that the connection between practices based on spatial proximity, can have different impact for the practices involved. It can lead to collective enactment or collaboration of multiple practice or to the significant transformation of others, but it can also lead to destruction of some practices (Ibid).

It can be argued that car-sharing and residing practices are connected based on spatial arrangements. Bergmaier et al. (2004) point out the connection between car-sharing and high density residential and commercial areas. This is due to the characterization of these areas having limited parking, and availability for walking, cycling and public transport (Bergmaier et al. 2004; Huwer, 2004). Furthermore, users of car-sharing stated that the access to the service is crucial, where most users accessed car-sharing from a distance of less than one kilometre (Costain et al., 2012). This further supports the argument that the co-location of car-sharing and residing is shared and the two practices are co-dependent.

Another study reported that car-sharing is beneficial as an additional mode of transportation and for people who need occasional access to a car due to their way of living and the built environment around them (Stillwater, Mokhtarian & Shaheen, 2009). The built environment typically includes buildings, sidewalks, road attributes, transport services (Ibid). As a result, it could be argued that the built environment as part of residing is connected to car-sharing practice.

Apart from spatial proximity, practices are also influenced by temporal relationships of sequence and synchronization (Shove et al. 2012). In other words, some practices have to happen at the same time following a specific order (Ibid). Hutchins (1995) describes the complex operation of leading a large ship into a dry dock, which requires the synchronization of multiple practices in that particular space. In this case, the spatial and temporal aspect of practices are intertwined very closely, thus it is impossible to separate the performance and coordination of the multiple practices (Shove et al. 2012).

Temporal relationships of sequence and synchronization could also be applied to car-sharing and the four practices described above, although there may not be as closely intertwined compared to the dry docking example. For instance, commuting to work with car-sharing depends on special sequence, where the car has to be firstly booked, picked up from the station, then driven to work, parked at work, driven home and lastly parked in the designated location. Similarly, in leisure practices, the users have to firstly plan their trip and reserve the car for the required amount of time and then load their luggage after the vehicle was picked up from the station.

All mentioned above, suggests that car-sharing has a connection with the four practices: residing, shopping, commuting and leisure activities. In the next section, we will examine the character of the connection.

Collaborating and competing practices

It is important to consider the intensity and character of the links between practices (Pantzar & Shove, 2010; Watson, 2012). Practice can have both interdependent and competitive relationships (Ibid). In fact, Shove et al. (2012) argues that bundles and complexes are formed and destroyed as a result of the nature of the link (competing or collaborating) between practices. As mentioned before for cooking, eating and

socializing, bundles of practices co-exist, but are merely related, while complexes, such the multiple practices required to get a passport, are interdependent (Pantzar & Shove, 2012). Thus, the notion of complex practices states that one practice may not exist without the other (Ibid).

In the previous section we demonstrated that the practices of residing, shopping, commuting and leisure activities are connected to car-sharing. We further argue that each of these practices is collaborating with car-sharing and forming a bundle of practices.

For some practices the order of performance is important, and the output of one practice can become an input for another practice (Shove et al. 2012). In this case the practice elements such as skills could be a requirement for another practice to be performed, thus these practices “collaborate” and form complex practices (Shove et al. 2012). For instance, mobility via car is dependent on vehicle maintenance and the lack of one practice has an impact on the other (Kent & Dowling, 2013). It can be argued that residing collaborated with car-sharing, where the output of residing in a highly dense urban area is needed for access to car-sharing as well as existence of car-sharing as a service (Bergmaier et al. 2004; Stillwater et al., 2009).

Practices are also connected through the elements (meanings, skills, materials) they share (Shove et al. 2012). Thus, the common elements shared by multiple practices create cross-practice “collaboration” (Ibid). For instance, the meaning of youth and modernity is shared by the practices of drinking, driving and wearing jeans (O’Dell in Shove et al. 2012). Similarly, the meaning of being environmentally conscious is shared by car-sharing and residing. Hildebrandt et al. (2015) reports that car-sharing users are usually environmentally friendly individuals. At the same time, previous

literature suggests that urban residents were more concerned about the environment compared to rural residents (Samdahl & Robertson, 1989; Zimmer, Stafford & Stafford, 1994).

Practices could also compete for resources or elements as well as attention (Shove et al. 2012). For instance, car-sharing practices can be competing with other practices for time management (Kent & Dowling, 2013). Car-sharing requires planning and scheduling in order to be performed, thus if planning and scheduling is not performed, it will be difficult to use the service (Ibid). Another example is where the practice of car-sharing is competing with car ownership and other traveling practices for meaning elements regarding cost. In this case, the car-ownership and car-sharing will compete for the meaning of “cheap” travel. To acquire that meaning car-sharing rates must be lower and the perceived savings must be higher, compared to car ownership (Costain et al., 2012).

Additionally, non-adopters of car-sharing were described to live with elderly family members and have fewer family members employed (Namazu et al. 2018), which suggest that the practice of car-sharing was not able to win resource such as time and attention from those practitioners.

All mentioned above strengthens the argument that car-sharing is linked and collaborates with other practices such as residing, shopping, commuting and leisure activities (Figure 1). To further understand the relationship between these practices in the next section the paper discusses the intensity and intersections of connected practices.



Figure 1. Car-sharing and its connected practices

Variations in relation to the connected practices

According to Pullinger et al. (2013), practice performances vary as they are arranged differently and at the same time in a way that is recognizable. These different arrangements can then become variants of the practice, both *within* and *between* practices (Ibid) For instance, Higginson et al. (2015), illustrate variations *within* the practice of doing laundry as it can be performed in various ways consequently becoming separate variants such as “simple home laundry” and “hand washing”. If we “zoom out” and consider the relationship *between* whole practices, we can find that multiple practices will be connected through different combinations of overlapping elements (Ibid). For example, the two practices of laundry and bathing can be connected through the shared meaning of “hygiene”, whilst the practices of laundry and relaxation can be connected through the overlapping skill of “self-care” (Higginson et al., 2015).

One exploration particularly relevant for this study is Allison Hui’s (2017) discussion on variations *between* practices. Hui (2017) argues that practices can have intersections through the practitioner and overlaps of shared elements, establishing different links and relationships between multiple practices that contribute to “the

production of variations within the social field or plane” (p.52).

Variations in terms of practitioners or elements at the intersection of practices

Investigating the variations between practices (different links and combinations of elements overlapping between practices) would give a better idea about how these variations influence the development of each practice involved and the nexus they shape (Hui, 2017; Higginson et al., 2015). The study employs method of analysis, which discovers variations between practices arising from the varying strength of their links (Hui, 2017) as well as the different formed combinations with the shared elements (Higginson, et al. 2015). Although, Hui (2017) suggests that the strength of the link could vary only based on the shared materials elements, we argue that this could be extended to all elements of a practice (materials, skills, meanings). Additionally, we use Star and Griesemer’s (1989) notion of materials taking on different connotation in multiple practices, to discover further variations. Using Hui’s (2017) approach to discover variations, we categorise two types of intersections: the practice elements and the practitioner.

Elements as intersection

The elements of practices could be viewed as the “intersection” or “crossing point” between several practices. These intersections could be material (e.g. computer used for business or leisure) or abstract (understanding of clock time) elements that are shared by multiple practices (Hui, 2017). Higginson et al. (2015) point out that multiple practices of people’s everyday life could be linked through the co-location of time and space as well as through shared elements. Schatzki also discussed the “overlap” of components of different practices that are “intrinsically connected to and interwoven with objects” (2002, pp.106). For instance, Shove et al. (2012) exemplifies that the meaning of being fat could be included in several

practices such as shopping, eating and working-out. Another example, is where the practice of driving and repairing cars are connected with the concept of masculinity (Ibid).

Star and Griesemer (1989) argued that “boundary objects” can have different meanings and can adapt to “different social worlds”, where the object has a common identity that can be recognized and translated into different worlds (p.393). Social worlds could be defined as common social systems that are determined by communications, shared symbols and activities, rather than geographical borders. (Unruh, 1980). Using Star and Griesemer’s (1989) notion of adaptable intersections, we argue that materials can change their form and connotation in different practices.

Practitioners as intersection

Reckwitz (2002) argues that practitioners are unique intersection points between various social practices. “As there are diverse social practices, and as every agent carries out a multitude of different social practices, the individual is the unique crossing point of practices, of bodily-mental routines” (Reckwitz, 2002, p.256). Hui et al., (2017) adds that the intersection of practitioner can be beneficial as it can transport skills or meanings on to another practice, or it can be detrimental where these elements can be conflicting, causing friction or even degradation of the practice. For instance, practitioner can have multiple roles that could alter the performance and in that case skills and meanings could be ill matched to carry out the practice. (Ibid)

Interaction between practices

Where elements and practitioners act as intersections between different practices, a chain of interaction between practices is formed, where an input of one practice is processed into output, which eventually becomes an input for another practice (Shove et al. 2012; Hui, 2017). The chain of actions, inputs and outputs gives the

possibility to determine how materials and practitioners are transformed in different forms and in what order the practices are connected (Hui, 2017). The materials and set of experience and skills needed from one practice for the production of another practice, in a specific sequence, showcases a variation (Ibid). This could be in the form of the amount of inputs and outputs required as well as the degree to which these are influential for other practices. Variations could be discovered based on the materials and practitioners, as not all materials will be used as frequently and some competencies could be mastered only by selected practitioners. (Ibid) As advised by Hui (2017) and Shove et al. (2012) the temporal sequences of practices is also important. When the practitioner cannot get a hold of the materials or skills required, this could result in inability to perform interconnected practices.

As a result, we argue that the four practices and car-sharing have: shared elements in various combinations, different strength of links, shared materials taking on a different connotation and various understandings for a practitioner with dual roles.

Method

In this study, qualitative interviewing was appropriate, as it allowed for a deeper understanding of the interviewee's journey (Bryman, 2016). The interviewee was free to discuss their own mobility and life routines. The research focused on gaining insights into one's mobility practices, thus semi-structured interviews were constructed with the aid of the interview guide. The goal was to get extensive insights on various mobility routines and possible obstacles that can occur, which an unstructured interview would have missed (Ibid). Grounded theory was chosen as a method of analysis where identified relevant categories and the links between them could explain a better connection of car-sharing and its connected practices in

Gothenburg, Sweden (Eriksson & Kovalainen, 2008).

Data collection

Data was collected through interviews which included users and non-users of car-sharing services, as well as experts working within an area of sustainable mobility. The study primarily focused on car-sharing practices, however car ownership was also examined in order to grasp the contrast when it came to analyzing related practices. The participants that used car-sharing, used companies “Sunfleet”, “MoveAbout” and a cooperative “Masthuggetsbilkooperativ”, which are all available in the center of Gothenburg.

Most of the respondents were users of Sunfleet, as it was the most popular and most known solution for car-sharing services. Sunfleet is a private company owned by Volvo, that operates in over 50 cities in Sweden providing around 1,400 different Volvo vehicles, which are no more than a year or year and a half old (Sunfleet, 2019). One of the respondents was a user of an electrical car-sharing company MoveAbout. MoveAbout was first established in Norway and began its operations in Sweden in 2009 providing car-sharing services using electric vehicles (MoveAbout, 2019). The company focuses on sustainability within mobility and according to the company’s knowledge, provides the biggest fleet in the world consisting of over 100 electrical vehicles (Ibid). The study also had one user of the cooperative car-sharing service Masthuggetsbilkooperativ. Due to the organization’s size it was difficult to interview more respondents using this service. Masthuggetsbilkooperativ was established in 1998 and is the only remaining operational cooperative car-sharing system in Gothenburg. It has a limit in membership size and serves about 50 residents with 6 shared vehicles within Linne and Masthugget area of Gothenburg (Masthuggetsbilkooperativ, 2019;

Respondent 16). The administration and vehicle related maintenance is arranged and conducted by all members, which allows for lower fees than the privately owned car-sharing options listed above. (Ibid) All services operate as a two-way car-sharing provision, where the car is picked up and dropped off at the same station.

Most interviews were done in person at homes of the participants, cafes, university campus and some via Skype. The interviews lasted between 25-110 minutes. The researchers got consent from the interviewees and the conversations were audio recorded. The in depth interviews may have been personal, thus respondents were promised anonymity to set a comfortable environment, where respondents opened up and spoke freely (Thompson, Locander, Pollio, 1989). Questions were formulated around participants’ mobility doings, awareness and possible struggles. At times questions may have been similar in the guide, however that allowed for the respondent to remember other experiences and add on new information that did not occur to them with the previous question. Follow up questions were used to establish a comfortable flow and get deeper insights on specific routine of the particular participant. (Ibid)

Additionally, two experts on mobility were interviewed to gain an understanding on car-sharing services from different perspectives. The data collected was then used in the practical implications discussion in the study. These experts worked on projects related to sustainable mobility innovation in Sweden locally and nationwide. Expert interviews also had a guide, however it was used to get the conversation flowing, where respondents discussed the topic of car-sharing as they saw fit to their area of expertise.

The participants were recruited by multiple methods in order to get a sample with

different users and different experiences. Initially participants were selected based on their central residence in Linne area of Gothenburg and close proximity to a popular car-sharing company “Sunfleet” parking stations. Other participants were students at Gothenburg University which is also located in central Gothenburg. Additionally, more participants were chosen through the snowballing technique (Eriksson & Kovalainen,2008). Residents close to the Sunfleet stations and students at the University were recruited through personal contacts, who were either neighbors or fellow students in relation to the researchers. Finally, the two experts were male and were selected for this study based on their area of expertise within mobility through help of professional contacts via social media website LinkedIn.

Participants included ages from early 20s to early 50s, and out of 16 respondents, 8 were female and 8 were male. Out of 16 participants, 12 of the respondents are or were car-sharing users at some point while living in Gothenburg and 4 have never used it. Participants that were once car-sharing users that later bought a car and those that were car owners only were also interviewed to get a better understanding of their routine practices and how they are in line or in conflict with what car-sharing has to offer in Gothenburg.

Interviews

| | Field |
|----------|---------------------------------|
| Expert 1 | Sustainable and Future Mobility |
| Expert 2 | Innovation and future mobility |

| | Company | Car owner | Car-sharing user |
|----------------|--------------------------|----------------------|------------------|
| Participant 1 | Sunfleet | before | currently |
| Participant 2 | Sunfleet | yes | no |
| Participant 3 | Sunfleet | yes | no |
| Participant 4 | Sunfleet | yes | no |
| Participant 5 | Sunfleet | yes | before |
| Participant 6 | Sunfleet | yes | before |
| Participant 7 | Sunfleet | yes | no |
| Participant 8 | Sunfleet | before | currently |
| Participant 9 | Sunfleet | no | currently |
| Participant 10 | Sunfleet | before | currently |
| Participant 11 | Sunfleet | yes | before |
| Participant 12 | Sunfleet | before (now borrows) | before |
| Participant 13 | Sunfleet | no | currently |
| Participant 14 | Sunfleet | no | currently |
| Participant 15 | Sunfleet / MoveAbout | before | currently |
| Participant 16 | Masthuggetsbilkooperativ | before | currently |

Data analysis

Grounded theory was used for the analysis of the data. Grounded theory is extensively applied in marketing research and it aids in understanding consumer market behaviour (Eriksson & Kovalainen, 2008). It is an inductive methodology that identifies emerging patterns in the data through continuous interaction of the analysis and data collection (Straus & Corbin, 1988). Grounded theory was used as method to identify categories in the data, link those categories and discover relationship between them. It was not used in its whole version to create theoretical models or test theories from the data (Eriksson & Kovalainen, 2008).

The audio interviews were first transcribed and then analyzed through open coding that gave rise to descriptive themes, which were given a label or a code related to mobility behaviour (cycling, driving, car-sharing etc.) (Eriksson & Kovalainen, 2008). These codes were then grouped to identify related subcategories to create more complex categories such as “alternative methods of transportation” or “convenience”, “economic incentives”, “freedom”, “car-equipment”. These categories were then grouped into larger categories, where the analysis departed from grounded theory approach, since pre-existing practice theory framework was used. (Ibid) These categories were based on the car-sharing practice elements including materials, skills and meanings (Pantzar & Shove, 2010). At the same time, inductively several practices connected to car-sharing were identified that fit in the following four categories: residing, shopping/errands, commuting and leisure activities. There were also, concepts from the data that did not fit into the predefined framework, which were not overlooked during the analysis and discussing, but less emphasis was placed on them due to the constraints of the thesis. (Eriksson & Kovalainen, 2008)

Quality

As advised by Eriksson & Kovalainen (2008), the traditional measurements of quality, such as validity and reliability used in quantitative research are replaced with those relevant to qualitative research. In lieu of reliability and validity the concept of trustworthiness is introduced, which includes credibility, transferability, dependability and confirmability (Ibid).

Credibility refers to the genuine representation and analysis of the collected data (Eriksson & Kovalainen, 2008). To achieve credibility during the interviews the researchers verified “fuzzy” statements with participants by repeating the information back to them, ensuring they were understood correctly (Cope, 2014). Moreover, data began to repeat itself, thus to the authors’ knowledge, the notion of saturation was achieved (Eriksson & Kovalainen, 2008). This study also had relative connection against previous literature, which satisfied the *transferability* aspect (Ibid). For instance, previous research also approached car-sharing studies using practice theory (Kent & Dowling, 2013; George, 2018) and analyses on variations between practices (Hui, 2017). This established connection of previous research and our results allowed for the research to go deeper by investigating connected practices (Eriksson & Kovalainen, 2008). All the data collected, which includes audio recordings, transcripts, notes and drawings is available upon request, thus satisfying the criteria of *dependability* ensuring that the data was not skewed during the analysis. For *confirmability*, authors remained objective on the subject, where previous knowledge on the car-sharing topic was not shared with respondents to avoid biased data. The semi-structured interviews also helped, where the respondent told their own account of their daily mobility practices. The interview questions and coding process were not guided by theory and instead contained questions and organization on how one gets

around for daily activities and trips. (Ibid) Respondents stories revealed various connected practices with car-sharing and in contrast to car use. These were later analyzed based on social practice theory and variations based on Hui's (2017), Higginson, et al., (2015) and Shove et al. (2012) discussions.

The main limitation of the research (Eriksson & Kovalainen, 2008) is the time constraint of five months, which restricted the researchers to conduct more in-depth interviews. Additionally, it was difficult to find users of car-sharing that used other companies than Sunfleet. Thus, the insights on car-sharing practices of members using other service were limited.

Results and analysis

The findings supported previous studies of car-sharing discussed in the literature review, which gave an understanding on, where car-sharing stands as a practice when it comes to materials, skills and meanings (George, 2018; Kent & Dowling, 2013). In this section we evaluate the elements and the practitioner as intersection between the four practices. The findings of the study will be divided in categories based on the intersecting practices.

Intersection between car-sharing and residing

In this section, the authors examine the relationship between the practice of residing and the practice of car-sharing. The authors argue that the two practices have a point of overlap, through a *vehicle*, *built environment* and *spatial proximity* as shared material elements of the two practices. Additionally, several meanings were related with the two practices: *environmentally consciousness* and *cheap*, which are argued to be intersections.

The authors already discussed the vehicle, spatial proximity and built environment as material elements of car-sharing. However, we further argue that the vehicle, spatial

proximity and the built environment can be considered as part of the residing practice. The built environment as part of residing can be identified with buildings, where practitioners live, the infrastructure around the building including roads, garages, parking facilities, and others (Kent & Dowling, 2013). Moreover, the practice of residing includes material elements such as spatial proximity and vehicle. As a result, there is a clear intersection between car-sharing practices and residing.

This was supported by the primary data, where the majority of the respondents suggested that car-sharing usage was heavily dependent on the residing location. In cases, where there were one or more than one car-sharing stations in close proximity to participant's home, within walking distance, they were more likely to use the service. For example, R5 said that there are many stations nearby which affected his car-sharing practices and respondent 8, stated that "*If it hasn't been that close then I probably wouldn't have used it to be honest.*" Furthermore, respondents (8, 9, 10, 14, 15) stated that they were willing to walk 15 to 20 minutes to a car-sharing station. Due to the connectivity of residing central, in cases, where car-sharing was used for long distance trips, respondents (6, 13) were willing to take public transport to the car-sharing station.

The findings supported previous literature (Bergmaier et al. 2004), which suggested that car-sharing operates well in high density residential, commercial areas with connectivity and (Costain et al., 2012) stations in close proximity; where all respondents that used car-sharing lived in central Gothenburg had a car-sharing station nearby or reachable via public transport. Moreover, some respondents (R10,14) decision to stop using car-sharing and to buy a car, was due to moving outside of Gothenburg, further showcase the close connection between car-sharing and residing as practices.

“..we agreed, me and my boyfriend, that this is a great solution (car-sharing) when you live in the inner city.. But we also agreed that this is not a solution for us ..If we move outside(the city)..I don't think we will see this (car-sharing) as a solution because we would need it for so many more things.. every time we go grocery shopping ..we will be more bound to use it (owned vehicle) if we're living outside of the city. ..I think it (car-sharing) will be a hassle. I think it will be better to have your own car.” (R14)

It can also be argued that residing in central location acted as an input material for practitioners to perform car-sharing (Shove et al. 2012; Hui et al., 2017). In this case the output of the walking or traveling by public transport, was needed as input for car-sharing practice, where the two modes of transport collaborated (Ibid).

According to secondary data urban residents are more environmentally conscious, which suggests an environmental meaning in the practice residing (Samdahl & Robertson, 1989; Zimmer, Stafford & Stafford, 1994). The primary data, demonstrated that the meanings of car-sharing were also often associated with being environmentally conscious and making sustainable choices. For instance, R10 said her reason to car-sharing was *“...to be part of a network who are only using cars and polluting the environment when they have to, but not a regular basis...”*. Similarly, R6, expressed his discontent with the need to own a car because of his job and preferred to use other modes of transportation. *“I dislike owning a car in general because it is expensive. But I like that it is expensive and I think the tolls are good as well..Fuel should not be cheap, because it's not good for the environment. And I think it's a good way to lower emissions to increase the cost of fuel”*

It is important to point out, that other users also brought up the environment during the interviews, but in most cases it was a secondary concern and aftermath thought,

rather than primary reason to consider and use car-sharing. Still for some users this meaning was present, suggesting an additional point of intersection between residing and car-sharing only for that particular group.

Another meaning *cheap*, was found to be shared by residing and car-sharing when it comes to residential parking. The meaning of cheap was underpinned by comparison of car-ownership parking burdens, which were found to be more expensive compared to car-sharing, where no cost is accrued. All respondents mentioned that parking, where they live is problematic when it comes to space provision and cost. For instance, some respondents (R2, R9) used their cars contingent on parking, where the car would be used if it had to be moved for street cleaning or not used if the spot was too precious to leave at a time when parking is scarcest. Respondents that later sold their car partly due to problems of parking provision and various parking costs, indicated that car-sharing provided a solution with its designated and free parking near their home. The service relieved the practitioner from the hassle of looking and paying for parking at the end of car use for the day. *“ I just need it (shared vehicle) when I need it. Instead of having to have have a garage spot or a parking space for it.”(R9)*. Problems of residential parking space and cost is solved with car-sharing where the practitioner assigns the meaning of *cheap* alternative to car ownership (Barth & Shahan, 2002). Thus, car-sharing is better connected with residential practices, where residential parking takes on a meaning of *cheap* via car-sharing.

All mentioned above, suggests that residing practice and car-sharing practice have a codependent and strong link, where the elements of the *built environment* and the meaning of *cheap* proves to be the crucial elements to connect these two practices.

Intersection between Car-sharing and Shopping and Running errands

This section analyses the two practices shopping and running errands and their relationship with car-sharing. Although, shopping and running errands could be considered as one practice, the authors analyse them separately as the purpose and performance of these two activities differed.

Shopping

This section focuses on the relationship between car-sharing and shopping practices and we argue that there is a cross-point between these two practices. Some of the material elements that form the practice shopping include the built environment of the retail space (parking, the retail physical location and space), spatial proximity, shopping carts and products and services being bought or looked at. Thus, it can be argued that car-sharing and shopping intersect through the material elements of the *vehicle, built environment, spatial proximity*, as well as *cargo*.

Our findings showed that car-sharing was often used for shopping trips associated with larger cargo and to stores located in the outskirts of the city such as IKEA, hardware or garden stores. For instance, R1 used car-sharing for visiting hardware, gardening stores and R1, R2, R6, R8, R11 all mentioned using car-sharing for trips to IKEA. Respondent 9 described that she used Sunfleet to transport a set of paintings from a store in the city centre to her home, as she was concerned that the items would be damaged if using public transport. Thus, shopping in specialized stores was interconnected with car-sharing due to the spatial proximity and cargo such as large or delicate items.

“I bought a couple of paintings and to take paintings on a bus is not the most convenient so I needed a car” (R9)

Respondent 1 also mentioned that she used car-sharing when she had a particular mission in mind *“maybe a couple of hours,*

just to do my mission, but i don’t take it just to go around and have a coffee with friends”, such as going to IKEA *“to go to, like IKEA to buy furniture, yea mostly stuff when you have to go somewhere to buy stuff but you don’t take on the bus”* This exemplifies that temporal sequencing of short duration shopping trips better connects with car-sharing, as the vehicle is not parked for a long time and does accumulate significant extra cost (Hui, 2017).

As Watson (2012) explains the connection between grocery shopping and mobility practices due to supermarkets being located in the suburbs of cities, also transform temporal rhythms of shopping groceries from several times a week to once a week. Respondent 7, who used his own car for grocery shopping mentioned it only in relation to discussing commuting to home or after a daily excursion with the family. Similarly, R10, R11 and R15, used car-sharing for grocery shopping, but it was not the primary type of store for car-sharing.

As a result, it can be argued that shopping in specialised stores was more heavily dependent on the output of car-sharing, compared to example for grocery shopping, which was not mentioned by participants as often (Shove et al. 2012; Hui, 2017). This could be because the majority of participants lived in central Gothenburg and had access to grocery stores in their immediate environment. Therefore, we argue that shopping in specialised stores had a stronger link with car-sharing compared to grocery shopping.

Running errands

Based on Cambridge definition we define “running errands” as the practice of taking a short trip to conduct some small business (Cambridge Dictionary, 2019). Similarly, to shopping, running errands had intersections with car-sharing, such as the *vehicle, the built environment, spatial proximity* and *cargo*.

The interviews with participants provided a few examples, where car-sharing was closely intertwined with running errands. For instance, R6, pointed out that he used car-sharing to travel to a recycling station, where the station is located far away from his home, and large cargo is carried.

“sometimes you want to go to the recycle station...that would be problematic doing by bus. And then we could run to the Sunfleet car” (R6).

Furthermore, car-sharing services were used, when moving from one home to another (R6) or just moving luggage to another house. For example, R9, used Sunfleet, to transport personal belongings from her apartment in Gothenburg, to her family’s house in another city.

“I needed to pick up my winter clothes and stuff that I had at my parents’ house. So, I knew that I was going to need a lot of space. So it was easier to take a car. I can pay for it over the weekend and then bring it back. And then I had all my winter jackets and winter clothes with me” (R9).

Again the usage of car-sharing was underpinned by the spatial proximity of the destination and the cargo. In this cases as mentioned by respondents (R6, R9) other transportation such as public transport would be inconvenient, encouraging members to use car-sharing. As respondents were heavily dependent on the vehicle provided by car-sharing to transport the cargo to their desired destinations. Thus, we argued that running errands has a strong connection with the practice of car-sharing.

Overall, car-sharing has a strong connection with shopping and running errands practices particularly due to the shared materials of *spatial proximity* and *heavy cargo*. When it comes to shopping/errands, car-sharing provides a convenient solution, which matches the temporal sequencing of two-way car-sharing and solves the need of transporting items over a longer distance.

Intersection between Car-sharing and Work Commute

In this section, the material and meaning elements’ intersection between car-sharing and commuting practices is investigated. The intersecting elements include *spatial proximity*, *vehicle* and the meaning of *expensive*. However, these are overlapping to a much lower degree, which is discussed in the following section.

Some respondents that moved into central city sold their car and used public transport, because their commute proximity allowed them to do so (Shove et al. 2012). For instance, R1 no longer felt the need for the car, when her office moved more central and closer to home. The car was an input in the main practice of work commute and once that was replaced by public transport, it affected the rest of the practices (Shove et al. 2012; Hui, 2017). On the other hand, R4 and R7 owned a car because they had to commute long distances, suggesting car-sharing was not a suitable solution for long distance commutes either. Overall, short distance to the workplace discouraged the need for a vehicle, while long distance encouraged car-ownership. Thus, *spatial proximity* of commuting did not match car-sharing offerings.

The meaning associated with car-sharing in the case of commuting was *expensive*, which is in contrast to the meaning *cheap* found with the practice of shopping and residing. As described by respondents the meaning *expensive* emerged due to a specific temporal sequence in two-way car-sharing. One must commute to work, park the car for certain amount of time and then commute back home. Although, the practice of car-sharing provides the required output - taking the practitioner to work and back, the car remains parked at work for a long period, making the service expensive. The meaning of *expensive* in regards to commute via car-sharing, prevented car owners (R4,R7) to start using the service and also caused previous car-

sharing users (R6,R11) to quit the service and buy a car instead.

On the other hand, the high cost of parking and tolls in the city centre arising from both car-sharing and private car use, caused some people to choose public transportation, where it was possible and convenient. *“It's also much more expensive to drive a car in Gothenburg now, compared to five or six years ago... the parking fees have been raised quite a lot actually.. you have the tolls. Which means that when I had my own car.., six years ago..an entire day would cost 40-50 SEK..Now, it's three or four times that amount..which means that it's very expensive for me to take the car to work.”* (R16). The lack of distinction from municipality in regards to tolls and parking provision and fees between car-sharing and car ownership might discourage users to choose car-sharing for commuting.

Yet, it is important to point out that, R13 and R10, were using car-sharing occasionally to commute to work, when they had to visit various locations in remote places. However, the temporal sequence of car-sharing fit their commute much better, as the duration spent at those locations was much shorter than an average working day, thus less costly.

For commuting and car-sharing practices there was a lesser degree of overlap of the *vehicle*, and *spatial proximity*. Moreover, the meaning of *expensive* had a significant impact, especially for people commuting towards the outskirts of the city and had the car parked for long periods. Overall these unstable intersections contributed to a weaker link between car-sharing and commuting.

Intersection between Car-sharing and Leisure Practices

Lastly, this sections evaluates the relationship between car-sharing and leisure practices. According to Cambridge dictionary (2019) leisure refers to time off

and for the purpose of this paper, we define leisure practices based on this definition as well as what practitioners discussed to be leisure practices (Shove et al. 2012). This includes going away for weekend or day trips, long distance holidays, sport activities or other recreational practices discussed by practitioners.

Leisure practices' material elements *spatial proximity*, *cargo* (sports gear, luggage and kids) and *vehicle* are argued to overlap with materials forming car-sharing (George, 2018). Additionally, the intersection between the two practices involve poor overlapping for meaning of *expensive* tied to temporal sequencing, and skills related to those of *time management* (booking/planning) and *loading/unloading*.

Hui (2017) explains that the variations between practices can also have an effect on the practitioners through the understandings, knowledge, and skills required from the practitioner, but also through their multiple “careers” as parents and leisure travellers. Thus, practitioner's understandings, knowledge and skills in relation to leisure practices based on the primary data is analysed in relation to the dual career as a parent (Ibid).

Respondent 8 found that car-sharing is an ideal solution when visiting family a few hours away from the city. As a single man, working and living central and mostly taking public transport, he found car-sharing as an excellent extension of transportation choices. *“ I think they (car-sharing services)work, and I think they solve my need of a car, or I have adapted to that.”* Many participants, who are not parents (R8, R9, R14, R15), used car-sharing for leisure practices and noticed that extra planning was necessary. For instance, R15 felt it was cumbersome to plan mobility with the rest of society and said that the car ownership was going to be the next step to eliminate planning hassle. In this case time management did not

always smoothly adapt with an additional planning and booking practice that is required by car-sharing (Kent & Dowling, 2013).

The complexity of planning became more evident for respondents that used car-sharing and had small children (Kent & Dowling, 2013). Their routine practices had more steps than those respondents without children, thus planning and arranging their practices with car-sharing was more difficult (R12). Respondent 7 found that taking his own car is easier than car-sharing, as it is sometimes hard to know when one would get out of the house with an infant. When car-sharing, R5 also experienced stress with time management due to his children and their cargo requiring extra time, which was taken from the predefined time slot available. As time became scarce, it was also stressful for R5 and R10 to get the car delivered back on time in case of traffic or the wish to have some spontaneity and flexibility. Car-sharing requires more resources and skills from the practitioner, which needs more attention to time management (Kent & Dowling, 2013). This was inconvenient for most respondents and especially troublesome for parents (Ibid).

Additionally, respondents with children mentioned the hassle of loading and unloading of things. For example, parents had to retrieve, carry and connect car seats into the shared car, as well as extra gear for children for after school activities (e.g. hockey gear) and same steps after the use of the car.

When comparing car-sharing to car ownership, some respondents (R 2, R4 ,R5) with children also voiced the practicality of leaving things in the car as a plus to car ownership, thus avoiding extra loading and unloading hassle. For example, ski trips became an additional practice for parents of young children and all respondents took an owned car. Interestingly, R5 who is a parent stopped car-sharing and bought a car specifically for ski trips, where he said: “

you have to with children and all the requisites. Equipment and staying warm you have to have a car” and “We thought we would be able to do more and of weekend day trip excursions, especially in the winter for skiing and in the summer for just doing outside stuff outside of the city.” Respondent 5, explained that buying a car would be much easier because of cargo, kids and time management (Kent & Dowling, 2013).

Due to the temporal sequencing of two way car-sharing use and meaning of *expensive*, it is difficult for car-sharing to be interlinked with unplanned activities. For instance, R1 and R5 felt that car-sharing accumulates cost, when the vehicle is parked for longer period of time, such as when visiting friends, family (R1) or outdoor excursions (R5, R14) (Hui, 2017). For example, a parent R1 says: “*You don’t take a car share to go to a friend’s house and stay there for many hours and then go back, because it is too expensive. Owning your own car doesn’t affect the price.*” Similarly, R5, who is also a parent, said “*when you sign up for car-sharing, you feel like spending money every minute you have the car right? So you really feel I should be efficient about how I use this ...we’re off in the woods and then park the car for six hours while you’re swimming in a lake... basically using it for like 20 minutes here and 20 minutes there but it’s getting that you are paying for six hours...*”. According to Costain et al., (2012) in order for car-sharing to be successful, there must be incentives in place, such as lower cost for service, which is not the case when car-sharing is used in connection to leisure.

It can be argued that the practitioner can have dual roles as a leisure traveler and as a parent leisure traveler. Children may influence the practitioner in terms of their understandings and skills as leisure travelers. Having children could impact on how the practice of car-sharing and leisure will be performed. For example, R4 had

hypothetically reasoned car-sharing, however he would have difficulty with leisure practices as a parent (Hui et al., 2017). “...not in the age that the kids are now... these kids can get car sick and things.. and that’s something they grow out of and wouldn’t like that to happen in a rental car or a car-sharing car. It’s better that it happens in my own car.” Respondent 5 mentioned that he disliked cars and that car purchase for leisure activities involving kids was not against car-sharing and “it was just our life circumstances...I could see having another period of my life where I didn’t own a car again.” In this case, car-sharing used for leisure traveling required more skills, attention and time than the practitioners as a parents could devote (Hui et al., 2017).

Most respondents expressed cost concerns about car-sharing, creating the meaning *expensive*, which was underpinned by temporal sequencing and a skill of time management to be an issue. This proves to be a reason for a weak link between leisure and car-sharing practices (Costain et al., 2012). Additionally, for parents there were weaker links between the practices due to issues with *cargo* (luggage and kids) and their varied understanding of the practice as a parent leisure traveller. Using car-sharing for leisure activities is then more suitable for non-parents, which is also supported by previous literature, where Namazu et al. (2018) argues that car-sharing is best fitted for people living central, singles or couples without kids. Overall, it can be said that there is a poor connection between leisure practices and car-sharing, due to a low degree of overlap of the shared elements (Shove et al. 2012; Hui et al., 2017).

Discussion

Variations in the links and connections between practices

All mentioned in the previous section, supports the argument that the links and connections between the discussed practices vary in the density (the degree of

strength) and each link is based on a different combination of shared materials (Hui, 2017; Higginson et al.,2015).

There is high density of the links between car-sharing and residing as well as shopping/errands. For residing, the crucial overlapping material elements were built environment, spatial proximity and matching temporal sequencing of two-way car-sharing. For shopping/running errands crucial material elements were spatial proximity and cargo that were matching temporal sequencing of two-way car-sharing.

On the other hand, lower density and weaker connection is observed between car-sharing and leisure activities, which was due to poor overlap of the elements of cargo, tied to time management and the meaning of expensive, due to temporal sequencing. Similarly, commuting had a weak link with car-sharing mainly due to the meaning *expensive*, but also because of the vehicle and spatial proximity having a low degree of overlap.

The degree of overlap between shared elements is important and has a great impact on the strength of the link, making these specific elements crucial to establish a strong bond between practices. Some elements were found to intersect to a high degree, forming a stronger link while others were intersected to a significantly low degree, making the link between practices weak. Thus, car-sharing was found to be inconvenient to be performed in combination with specific practices such as commuting and leisure activities.

This provides an understanding, how car-sharing practices need to change in order to address these less overlapped intersections. This in turn will strengthen the connection between practices, making them closely intertwined. In other words, it would make the performance of car-sharing with other daily practices easier and smoother.

Variation of the elements between practices

In this section, the study discusses how the shared elements are taking varying forms in the four analysed practices.

Variations of the meaning on cost

Firstly, the meaning of cost varied from *cheap* to *expensive*, and had a different effect on the link between practices. On one hand, in residing practices, car-sharing took the meaning of *cheap* due to eliminating of the residential parking fees. This attribute of car-sharing had a positive effect and contributed to the strong link between residing and car-sharing. In shopping/errands cost was not an issue and did not have an impact on the link of the practice due to the short duration of the vehicle usage. On the other hand, cost had a negative impact on the link of commuting and leisure practices, where car-sharing took the meaning of *expensive*. This meaning was associated with car-sharing, because an extra cost was accumulated even when the vehicle was not driven, but simply parked. Thus, practitioners chose not to perform leisure or commuting practice in combination with car-sharing. All mentioned above, gives a clear indication of variation between practices based on the different meaning *expensive* or *cheap* that car-sharing takes in the four practices. Therefore, car-sharing businesses have to transform the service to be able to shift the meaning of *expensive* to *cheap* in commuting and leisure activities.

Variation of the material cargo

In the primary data cargo (luggage, kids and their gear) was not mentioned for the practices of residing and commuting, however it was crucial for leisure practices. The material of cargo varied in its form and the material took a different connotation, which supports Star & Greisemer's (1989) argument about materials adapting into different social worlds.

In shopping/ errands cargo contributed to stronger link between the practices and was

accommodated for, with generous trunk space in the car-sharing vehicles. On the other hand, in leisure practice, cargo contributed to a weaker link between the practices, because it was underpinned with practitioner's issues related to time management of restricted schedule and extra time needed for loading /unloading. In leisure practices, parents were the only ones that brought up cargo, because in their case not only did it include luggage, but also children and their required gear (child car seat). Both parents and non-parents mentioned time management, however for non-parents it was not enough to stop them from car-sharing.

The varying form that cargo takes in the two practice of shopping/errands and leisure indicates that car-sharing services need to be adjusted to accommodate that variety and make the service also fit with leisure practices (Star & Griesemer, 1989; Hui, 2017).

Improving car-sharing

The provision of car-sharing services is not suitable for commuters or those traveling long distances. Thus, according to the temporal sequencing issue described in the findings, it is suggested that one-way car-sharing should be introduced in combination with two-way car-sharing to relieve the problematic issue of monetary cost. Having one-way car-sharing, would allow for one to leave the vehicle at another station and book it again at the time that suits them (Nourinejad & Roorda, 2015). This would also allow for the same car to be used by others instead of remaining parked and accumulating cost for one user. Thus, using the vehicle to its full potential would fit the notion of sustainable mobility (Botsman & Rogers in Lawson, et al. 2016). Additionally, we argue that one-way car-sharing could provide perception of economic value comparing to car ownership (Costain et al., 2012). For example, when commuting to work, members can end their journey and reservation at their workplace and then start

a new journey again at the end of their work day. Thus this would prevent accumulation of extra cost during the period, when the car is not in use. Although free floating is a possible solution, it could be problematic due to parking policies and space provision in the city center (Nobis, 2006), as illustrated previously in the case of DriveNow failure in Stockholm (Jelica, 2018).

Namaz, et al. (2018), state that car-sharing works best for those without children. However, parents that were interviewed lived central, which connected well with their residing practices and car-sharing. There is a potential for these users to choose car-sharing in their leisure practices, however they should find the service to be convenient and not an additional hassle. Subscriptions for these users should consider the struggles with travel as parents and offer short cuts that seamlessly adjust to their lifestyle. A suggested feature could be extra time to load the car free of charge, offer these members more vehicles in the area where car seats are already installed and work with municipality in arranging car-sharing loading parking spots near or inside apartment buildings.

Another suggestion that could improve car-sharing practices was identified based on discussion with mobility experts. In the future, car-sharing services could be integrated with other services, such as shopping, commuting or residing. For example, visiting specialised stores like IKEA, would include the transportation by a shared vehicle provided by the store and will be part of the shopping experience. Similarly, purchasing an apartment could include the access to car-sharing service as package in the residential association. This would allow not only for better established links between the practices, but also for car-sharing to be so closely intertwined with other daily activities that the performance of the multiple practices cannot be separated (Hutchins, 1995).

Conclusion

The aim of this study has been to analyse how car-sharing practice can be improved to better connect it with associated practices in order to achieve a higher adoption of the service. Users of car-sharing schemes as well as car owners and non-owners were interviewed. By answering our research question *How elements of car-sharing as a practice intersect and establish variations with other associated daily practices?* we identify which elements are intersections between car-sharing and its associated practices. For residing and car-sharing the crucial intersections were: built environment and the meaning of cheap, in addition to environmental meaning, which was not as influential. For shopping/errands and car-sharing important shared elements were: spatial proximity and cargo. On the other hand, commuting and leisure activities had limited overlaps car-sharing as their shared elements do not overlap to a high degree and hinder the connection between the practices. The poorly overlapped elements of commuting were: spatial proximity, vehicle and the meaning of expensive, while for leisure activities were: meaning of expensive, cargo (luggage and children) and the understanding of the practitioner as a parent.

These results provide an overall understanding about the variations in the links between the practices at hand (Hui, 2017). Shopping/Errands and residing are closely connected with car-sharing, making their performance with car-sharing seamless. In contrast, commuting and leisure practices are not well connected with car-sharing making them inconvenient and problematic for practitioner to perform in combination with car-sharing.

In line with Higginson et al. (2015) we discover that the connected practices share different combinations of overlapping elements. As discussed some combinations of elements have contributed to a stronger

connection between the practices that are more stable and harder to break. Furthermore, we demonstrated how the same material objects could have varying forms and connotations in different practices (Star and Greisemer, 1989). The material element cargo had a negative connotation in leisure practices, and weakened the connection with car-sharing, making it easier to break the link between the practices. On the other hand, cargo had a positive connotation in shopping/running errands practices, where it strengthened the link with car-sharing. Similarly, the meaning related to cost, also took varying forms in the different practices, where car-sharing for commuting and leisure activities were viewed to be *expensive*, while car-sharing for in terms of residing was perceived as *cheap* due to eliminating the parking cost. This suggests that car-sharing meanings related to cost need to be shifted to make the transition from car-ownership to using car-sharing for consumers easier. After identifying the variation of the links, meanings and materials, we answer our second research question *How car-sharing can be improved to establish stronger links with other connected practices?* by suggesting some solutions that may strengthen the links between car-sharing and the practices discussed. The solutions include implementation of one-way car-sharing in Gothenburg, adjustment in service to accommodate those traveling with children and finally integration of car-sharing with other services to establish a seamless travel experience.

Theoretical Implications

The findings in this study are both supporting previous literature (Kent & Dowling, 2013; Bergmaier et al., 2004; George, 2018) and providing new insights in the academic field of practice theory, and specifically about the intersections and variations between practices (Hui, 2017; Higginson et al., 2015).

Building on previous studies that explore variations within a practice and define the relationship between the elements, as well as the thickness of their link, we “zoom out” to find the relationship between various practices. Scholars previously identified the degree of “thickness” and “stickiness” of the links between elements within a practice (Higginson et al., 2015; Koroschetz, 2019). In the same way, we apply this concept to the links between practices and we discovered that the shared elements are overlapping to a different degree and thus contributing to a stronger or weaker link between practices.

With our study we contribute to the field of car-sharing research by identifying and providing new insights about service’s connected practices (Shove et al. 2012), the different combinations of shared elements (Higginson et al., 2015), the variations of the links (Hui, 2017), and the material elements that take different connotations in the discussed practices (Star & Griesemer, 1989).

Future research

This study was conducted in Gothenburg, which is an urban area. Future research could extend to other cities, but also explore any difference between practices in urban and rural areas and how car-sharing could be designed to accommodate a larger group of the population. Furthermore, the data was collected mainly from users of the car-sharing service provided by Sunfleet. Therefore, it could be interesting for future research to focus on other service providers such as cooperatives that significantly differ in their offering and operational structure. Since this study is exploring variation between practices, it could be useful to investigate whether there are any variations within car-sharing and how that could be used to improve the service. Finally, our research suggested that there are significant differences between the car-sharing performances of parents and non-parents, and the challenges they are faced with, which could be further explored.

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