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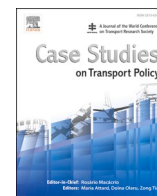
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# Shifting from ownership to access and the future for MaaS: Insights from car sharing practices in Copenhagen

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## ABSTRACT

Mobility-as-a-Service (MaaS) is seen as a sustainable alternative to private car ownership in cities. It builds on the idea of a seamless and integrated system providing access to multimodal mobility options, including shared mobility services like car sharing. However, studies of user experiences with MaaS are still few, and a better understanding of how such integrated, multimodal systems will fit with the everyday life of citizens is needed. This paper applies social practice theories in an empirical study of how shared mobility, like in car sharing, is integrated within the complexity of everyday practices of citizens. The analysis is based on qualitative in-depth interviews with families using a Copenhagen car sharing scheme, where the members of the scheme can rent a car for shorter or longer periods of time. The interview findings are related to a review of how the use of MaaS is represented in existing MaaS schemes. The empirical analysis shows how the embodied routinization of everyday mobility, and its entanglement with other everyday practices, contrast with current MaaS schemes being anchored in an understanding of everyday mobility as flexible and based on rational, informed and choice-making decisions. It is argued that future MaaS designs should take into account the embodied routinization and entanglement of everyday mobility practices. The paper recommends three ways forward to promote MaaS as an alternative to private cars: MaaS designs and strategies should recognise the importance of the interrelations between mobility and other everyday practices, strategically highlight positive benefits of MaaS that challenge the conventional ideas of freedom associated with individual car ownership, and combine MaaS with broader policies to limit private car traffic through initiatives like road-pricing.

## 1. Introduction

The continued growth in car-based transport results in increasing levels of climate change impact. In Denmark, car-based passenger transport accounts for about 20% of the CO<sub>2</sub> emissions related to energy consumption (Danish Energy Agency, 2020). While other consumption areas have demonstrated reductions in recent years, the emissions from transport continue to increase. Thus, there is an urgent need for reducing mobility-related emissions. This call for action is strengthened by additional negative implications for the environment, public health, congestion and liveability of cities from a system dominated by auto-mobility and private car ownership. Therefore, a sustainable transition of mobility systems is needed (Freudendal-Pedersen et al. 2020).

While car-based mobility seems to gain a further foothold, new technical and organisational trends might challenge the existing regime of automobility. Sperling (2018) and Axsen and Sovacool (2019) have

identified three dominant trends of innovation that are expected to have a major impact on future mobility: electric vehicles, shared mobility and automated vehicles.

In parallel with this, the concept of Mobility-as-a-Service (MaaS) has emerged in discussions of future mobilities. While no consensus on the definition of MaaS yet exists (Jittapirom et al., 2017), Hensher et al. (2020) identify some commonalities across different applications of the concept:

To qualify for MaaS, the scheme or product first must offer a mobility service with the user at centre of the offer; second the mobility options offered must be selected from a multimodal portfolio and finally, the offer must provide the integration of transport services starting from providing the information for travel, enabling a payment option ... and providing the ticket for travel. (p. 41).

In addition to being a user-centred, multimodal and integrated

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transport service, many authors also include normative goals like sustainability and reduced private car ownership in the definition of MaaS. For instance, Sochor et al. (2018), who have contributed with an oft-cited MaaS typology, define the highest level of MaaS (level 4) as “integration of societal goals” with the “added value” of “reduced private car ownership and use, a more accessible, livable city, etc.” (p. 11)<sup>2</sup>. Recently, Hensher et al. (2021a) have developed a more elaborated version of the original MaaS definition in Hensher et al. (2020); in the updated version, the achievement of sustainable policy goals is featuring a more central role in the definition of what MaaS is, and it is stated that MaaS might also include non-transport-related service offerings (the latter is elaborated further in Hensher & Mulley, 2021).

In short, MaaS usually denotes the ideal of a shift from car ownership to a system based on a seamless integration of mobility modes, which the users can access via one single platform (a smartphone app). The mobility modes typically include both “traditional” public transport services and private services (e.g. taxi), combined with shared mobility services such as car, ride and bike sharing. The latter modes of transport have attracted a large amount of attention in recent years as they are often associated with a general transition towards an economy based on sharing or collaborative consumption (Schor & Fitzmaurice, 2015). Overall, MaaS involves a shift from ownership to access with possible implications for the everyday life of citizens. However, research has so far provided limited knowledge on user experiences with MaaS solutions (Utriainen & Pöllänen, 2018; Lyons et al., 2019).

Hensher et al. (2022) suggest that car sharing schemes could be a “stepping stone” in the transition from a regime of private car ownership to a broader diffusion of MaaS (in their paper, they focus specifically on electric car sharing). The authors conclude that the car “as an entity” is not about to disappear, and therefore the challenge “is to find better ways of utilising the car and still move forward to achievable sustainable outcomes” (ibid.: 215). In this paper, we will study Copenhagen families’ experiences with integrating car sharing in their everyday life. Based on in-depth qualitative interviews, our aim is to contribute to a better understanding of how shared mobility in the shape of a car sharing scheme fits with the daily practices of citizens living in a major city (including aspects of everyday planning). In doing this, we will draw on theories of practices (see later). A second aim of the paper is to explore how these findings can inform the design of more sustainable shared and integrated MaaS solutions.

Copenhagen is an example of an urban environment where it is possible for citizens to live without a private car, in part due to its well-functioning public transport and bike infrastructure. In terms of information, public transport in Denmark is highly integrated through a digital national multimodal journey planner (<https://www.rejseplanen.dk>) and in terms of payment through a personal travel card (“Rejsekort”) valid for all public transport modes (similar to Level 1 and Level 2, respectively, in Sochor et al., 2018). In recent years, shared mobility solutions like car sharing, bike sharing and e-scooters have gained ground in major Danish cities like Copenhagen. Therefore, Copenhagen is an interesting context for studying the shift from ownership to access and the future for MaaS.

The next section presents our theoretical approach, which draws on social practice theories. This is followed by an introduction to the applied methods. Then follows a literature review of existing studies of user experiences with MaaS and some observations on user practice representations, i.e. how the use of MaaS is envisaged in existing MaaS schemes. We then present our empirical findings from the qualitative interviews, compare these to the findings from the literature review, and discuss their implications for designing MaaS in the future. The paper finishes with conclusions and recommendations.

<sup>2</sup> The other levels are integration of information (1), integration of booking and payment (2) and integration of the service offer (3).

## 2. Understanding everyday mobility with practice theories

One way to study how new, shared mobilities become embedded in people’s everyday life is through a practice theoretical perspective. Practice theories have been applied to a wide range of everyday consumption fields, including food, energy and water (Gram-Hanssen, 2008; Shove & Walker, 2010; Warde, 2005). In more recent years, scholars have increasingly engaged with practice theories to study mobility from an everyday life perspective (Dowling & Kent, 2015; Friis, 2016; Hasselqvist et al., 2016; Kent & Dowling, 2013; Laakso, 2017; Spurling & McMeekin, 2014).

Practice theories imply a change from studying individual behaviour to the study of *practices* by viewing people not as individuals, but rather as carriers of practices (Reckwitz, 2002). Even though the empirical approach is to study the individual performance of practices, such an approach is also a study of the collective entity of what people do and say, the practice-as-entity, which exists across time and space of these performances (Schatzki, 1996). Practices thus structure performances, but through their performance, practices are also reproduced in certain ways (Southerton, 2012). Practice-as-entity is the structural foundation of a practice shaped by interlinked and heterogeneous elements, such as meanings, materials, and competences (Shove & Pantzar, 2005). A practice of commuting by bike is thus shaped by elements of meanings, e.g. that it is the fastest, healthiest and most convenient way to get to work; of materials, e.g. the bike itself and the infrastructure of the city that allows for bicycling; and of competences, e.g. the skills of going by bike and the knowledge of traffic rules. Thus, from a practice theoretical perspective, change in practices can only happen through changes in the individual practice elements and how they interrelate.

Mobility practices are usually performed in connection with other everyday practices. This means that mobility practices both influence on, and are influenced by, these other practices. The vision of MaaS entails an integration of several mobility solutions connected to different mobility practices that are closely embedded in people’s everyday routines of working, shopping, visiting friends and family etc. Hence, shifting mobility from ownership to access may imply changes to a variety of other aspects of everyday life than mobility alone. Therefore, there is a need to also understand the interrelated sets of everyday practices that mobility is part of in order to explore the potential of MaaS to provide a sustainable mobility system (Hesselgren et al., 2019; Friis, 2020). In relation to this, Kent and Dowling (2013) point to how the shift from car owning to car sharing may imply changes to household practices like everyday planning and time keeping, a shift which has been studied only to a very limited degree.

Practice bundles and complexes refer to the interlinkages between different practices, but these links vary in intensity and character between the two concepts (Watson, 2012). In practice bundles, practices exist separately but share aspects of time and/or space (Pantzar & Shove, 2010). In practice complexes, practices are hard or impossible to separate because they are co-dependent by being functionally integrated in terms of sequence, synchronization, proximity or co-existence (Shove, Pantzar & Watson, 2012). Clearly, such temporal-spatial interdependencies between practices only exist and develop through the performance of the practices of which they are comprised. Through performance, some sets of practices acquire dominant status in competition with other sets of practices, something that is continually reconfigured as practices are reproduced (ibid.). Watson (2012) highlights the need for appreciating both the interdependent and the competitive relations between practices in order to understand the dynamics of practices and how practices change. He argues that practices exist within broader systems of practice, and that change processes often arise because of the shifting of practices within these systems. MaaS, understood as integrating various forms of mobility practices, can be considered such a system of practices (Hesselgren et al., 2019). Studying not just mobility practices, but also the bundles or complexes in which they are interwoven, can therefore enhance this understanding of the *systemic*

relations in which mobility practices are embedded and thereby provide insights on how to design shared mobilities and MaaS in future sustainable mobility systems.

This paper applies practice theories to an empirical study of how families perform car sharing as a practice in relation to other everyday practices. This way, the paper provides insights into how a transition from ownership to access affects families' everyday life and it informs the future design of integrated mobility solutions like MaaS. The latter is done by comparing our empirical findings on car sharing with an analysis of what we have termed *user practice representations* of MaaS. This term is inspired by Akrich's concept of "scripts" (1992, 1995), which describes how technology designers "inscribe" their visions of prospective users, and how these are expected to use the designed objects, into the physical design as well as the socio-technical encoding of objects through advertisement campaigns etc. The users of the technology (object) might not necessarily adopt the intended usage vision of the designers, but it is "likely that the script will become a major element for interpreting interaction between the object and its users" (1992: 216). Therefore, it is important to understand how designers envision how users are going to use what they design, which we call user practice representations and explore further in Section 4.2.

### 3. Methods

The empirical work of the paper consists of qualitative semi-structured interviews (Brinkmann & Kvale, 2015) with seven families living in central Copenhagen who currently use the same car sharing service (see Table 1). It is centred around families with children, as they provide a unique opportunity for studying changes in mobility practices, because considerations of car access are often connected to the event of having children (Freudendal-Pedersen, 2009; Godskesen, 2002). The car sharing service investigated for this paper is a non-profit association offering station-based (round-trip) car sharing, where the cars have dedicated parking spaces at their "stations". The members typically pay a monthly fee (around 30–56 euro per month), and when renting a car, they pay a rent combined of two elements: a duration fee (typically around 4 euro per hour) and a distance fee (0.2–0.7 euro/km). Fuel consumption and insurances are covered by these payments. It should be mentioned that car ownership and car driving are in general expensive in Denmark due to high car and fuel taxes. The members book cars online.

Informants were recruited on a voluntary basis through the car sharing service's newsletter. The recruitment letter stated several selection criteria (families with children/planning to have children,

**Table 1**

Overview of interviewed families and interviewees. All names are pseudonyms.

Family (Parents; age in brackets)	Number of children and ages	Former car owner?
Family A: Tina (late 30s)* and Peter (early 50s)*	One child (3) + one on its way Peter: Three grown-up children from former relationship	Yes
Family B: Søren (42)* and Lise (45)	Three children (9, 13, 15)	Yes
Family C: Lars (49)* and Louise (49)	Three children (12, 16, 20)	No
Family D: Thomas (38)* and Sanne (34)	Two children (8, 11)	Yes
Family E**: Jan (42)* and Lise (36)	One child (1)	Yes
Family F**: Rita* (early 50s)	One child (15) who partly lives with Rita and partly with her former husband	Yes
Family G**: Benny (46)* and Ruth	Three children (10, 18, 22) from Benny's former marriage, who only visits every second weekend, and one child (15) together with Ruth	Yes

\*participated in interview; \*\* Online interview.

residence in central urban areas of Copenhagen, no private car ownership) and the main research interests (everyday life, mobility needs and transport habits).

Despite many individual differences, the interviewed families share some similarities regarding overall mobility patterns and everyday conditions: All parents commute by bike between home and workplace and only occasionally use public transport. Except for one, all interviewees have previous experiences with owning their own car. Also, except for one family living in a single-family home, all families are living in apartments without access to free parking space. Spending time and expenses related to car parking are in general expressed as one of the major problems related to car ownership and are one of the reasons why the interviewees were generally positive towards the car sharing service.

An interview guide focused on unravelling the families' everyday routines, including how they were affected by the shift to shared mobility, guided the semi-structured interviews. The semi-structured interviews lasted about an hour and a half, except for one lasting three hours, and were all audio recorded followed by verbatim transcription, structuring and categorization of statements related to main analytical concepts and analysis. Rather than gaining generalisable findings, the purpose was to explore details within the interviewed families' everyday routines and thereby indicate points of awareness for the future development of MaaS.

The empirical work was undertaken during the COVID-19 pandemic with four interviews taking place in late spring 2020 and three taking place in the winter 2020/2021. The latter interviews were carried out as online interviews due to COVID-19 restrictions at the time. Even if face-to-face interviews provide the ideal interview setting for rapport between interviewer and interviewee (Brinkmann and Kvale, 2015), the online interviews proved effective in opening up for detailed everyday stories (see also Deakin & Wakefield, 2014). COVID-19 was also included as a theme in the interview guide to allow for investigation into its effects on car sharing, but the interviews showed that even though COVID-19 changed families' everyday life significantly, the fear of infection had little direct influence on their willingness to use car sharing. However, due to overall lower social activity in society, the families used the car sharing service more infrequently during the pandemic.

### 4. User experiences of MaaS and MaaS user practice representations

In the following, we firstly review the literature on previous studies of user experiences with MaaS, and secondly, provide an analysis of how the use of (future) MaaS solutions is represented by actors within the field and in existing MaaS schemes. Both reviews will inform the discussion of possible implications for MaaS from our empirical study of car sharing.

#### 4.1. Previous studies of user experiences with MaaS

The last decade has seen many small-scale MaaS trials around the world, particularly in Europe, but few have been combined with systematic studies of the users and their experiences, resulting in a gap of knowledge (Hensher et al., 2020). Among the few well-documented trials are UbiGo (e.g. Karlsson et al. 2020), a six-month trial in 2013–14 in Gothenburg, Sweden, and the Sydney MaaS trial (e.g. Ho et al., 2021), a five-month trial in 2019–20. UbiGo involved 83 households who were offered customised subscription plans providing an integrated one-stop access to public transport, car rental, taxi, and car and bike sharing managed via a smartphone app. An overall finding was that the UbiGo scheme promoted changes in households' mobility patterns away from private car use and towards use of mainly public transport and car sharing (Sochor et al., 2016). Interestingly, the lack of private car access reduced the number of small errands that were previously done by car; one participant explained that they had stopped "going out

just to buy an electrical cord” and instead bundled these types of trips (ibid.: 60). The interviews with the UbiGo participants indicate that shifting from car ownership to access through a MaaS subscription makes car use more visible to the participants and inspires a more “economising” car use practice. The participants also developed new habits to reduce the need for a car by beginning to meet friends downtown instead of driving to their home for dinner, shifting from shopping at large supermarkets to local grocery stores or to do more online shopping (Strömberg et al. 2018). This shift in habits was partly related to the additional need for pre-trip planning of car sharing, which made car use less attractive (Sochor et al., 2016). This indicates how the shift from ownership to access affects both mobility and other everyday practices related to car use and involves new skills to organise activities and obligations in daily life.

The Sydney MaaS trial employed an innovative trial design by successively adding new mobility bundles throughout a five-month period, starting with a Pay as You Go in the first month followed by four bundle offers developed dynamically on basis of trial findings and feedback from the participants (Ho et al., 2021). The Sydney MaaS trial involved 93 employees from a large Australian insurance company. The bundles combined public transport, ride-hailing, taxi, car sharing and car rental in different offers, each of them differing in the size of the monthly fee and the type of discounts offered. The bundles were designed with a strategic aim of creating a portfolio of individually distinct offers that, in sum, could incentivise as many participants as possible to shift from the default Pay as You Go scheme to a bundle offer. The trial was rather successful in achieving this, as 46% of the participants had changed to a bundle by the fifth month of the trial (and just before the trial had to be closed due to the outbreak of COVID-19). One of the key outcomes of the Sydney MaaS trial is the successful demonstration of employing an incremental, data-driven and co-designing approach to the development of mobility bundle offers. Another important finding is that the developed bundle offers did result in lower private car use among the participants (Hensher et al., 2021b). Also, the study found, based on a qualitative survey among participants, a preference towards smaller “mobility packages” of only two–three mobility solutions rather than comprehensive bundles with a broad selection of modalities (ibid.).

Though being a pioneering MaaS scheme, no academic evaluations of the user experiences of the Finnish Whim have been published yet. However, a report from Rambøll (2019) showed that public transport covered 95.2% of the Whim trips, followed by taxi (3.75%), city bikes (1.02%), rental car (0.03%) and car sharing (0.001%). As Hensher et al. (2020:63) conclude, these figures “suggest mild multimodal travelling and showcase quite clearly how central public transport is to the Whim concept”.

MaaS studies applying the theoretical approach of social practices are close to non-existing. The only exception, to our knowledge, is Hesselgren et al. (2019), who apply practice theories as the analytical lens in a study of user practices in a Swedish large-scale corporate MaaS trial that targeted the internal and commuting-related transport of employees of a large company. The study concludes that as MaaS schemes are socio-technical systems, system components (materials, competences and meanings) “must all be integrated for the MaaS to support a reduction in the use of private cars” (ibid.: 9).

#### 4.2. MaaS user practice representations

“The central idea of MaaS is a promise that we will get you where you need to go, but how we get you there is not fixed” (Hietanen, 2020). This is how Sampo Hietanen, CEO of Maas Global (the company behind Whim) and a pioneer within the MaaS development, nails down his understanding of the core idea of MaaS. On the website of Whim, the concept of MaaS is explained with sentences like this: “Whim ... gives its users all city transport services in one step, letting them journey where and when they want with public transport, taxis, bikes, cars, and other options, all under a single subscription.” (Whim, 2020). The easy access

anytime and anywhere to mobility through a smartphone app is highlighted several times, and the smartphone app features prominently on the website. The website also states that MaaS “offers a true alternative to car ownership” (ibid.).

Similar to the key characteristics of the MaaS concept identified by Hensher et al. (2020), and cited in the introduction of this paper, the website of Whim presents through words and images the mobility practices of its users as flexible, multimodal, seamlessly integrated and convenient. With the Whim app, the place- and time-dependent complexities of moving from place to place within the cityscape as part of people’s everyday routines are reduced to a question of optimising the movement from point A to point B via an integrated use of the transport flows in the city. The journey planner is a key feature of the Whim app.

A similar representation of MaaS service usage can be found in another European MaaS scheme: EC2B in Gothenburg, Sweden. This trial was initiated in 2019 and is offered specifically to the residents in a new-built, ecological and centrally located tenant-owned apartment complex in Gothenburg. This small-scale neighbourhood-approach makes EC2B different from Whim. On the website of EC2B, MaaS is presented as a service that makes everyday life easier, and the connection to sustainability goals is much more explicit than in Whim. The website states that “EC2B develops simple and sustainable transport solutions and mobility services for everybody who wants to simplify her/his everyday life and contributes to a more resource-efficient society. Easy to B and Easy to be.” (EC2B, 2020; our translation). Still, the smartphone app features prominently on the website through words and pictures, and the app is said to offer a “quick overview of which transport alternatives that are available here and now” (our translation). Again, the MaaS mobility practice is presented as a flexible, multimodal and technology dependent enterprise. With the promise of offering a simpler and more convenient everyday life to its users, the website indirectly portrays existing mobility practices (prior to EC2B) as inconvenient and complicated.

This portrait of today’s mobility practices as being cumbersome, unreliable and inconvenient compared to the effective, integrated and smooth future of MaaS mobility practices is perhaps best illustrated in a 2015 report from the international transport consultancy Atkins (Atkins, 2015). Here, today’s multimodal mobility practice is presented as complicated and full of unforeseen public transport delays, resulting in late arrivals for meetings, appointments etc. This is contrasted with the “future of MaaS”, where the MaaS app offers integrated and intermodal journey planning with easy payment. The app works as a “personal assistant” that keeps track of one’s daily schedule in order to advise if trains are delayed and recommends the most comfortable trip based on weather forecasts. The imagined future MaaS mobility practices are represented as deeply reliant on smart devices that organise daily travelling in the most optimal way according to efficiency, convenience and comfort.

The above representations are taken from existing schemes and commercial actors within the field. As such, it is no surprise that these depictions are permeated with rather optimistic and idealistic narratives about the revolutionary promise of MaaS. However, as Lyons et al. (2019) point out, MaaS might be neither new nor revolutionary, but is better understood as an evolutionary continuation of previous efforts on transport integration dating back at least two decades. In their paper, Lyons et al. develop a taxonomy for the level of MaaS integration. Their taxonomy and understanding of the user perspective takes as its basis that travelling involves physical, cognitive and affective efforts related to preparing for and undertaking journeys. On this basis, Lyons et al. presuppose that “a traveller would typically be seeking a door-to-door journey for which the cognitive effort is as low as possible”, which “calls for a journey that is convenient to plan, book, pay for and execute successfully” (ibid.: 29). They notice that the private car is traditionally seen as providing exactly this type of convenience; something that MaaS “seeks to emulate or surpass” (ibid.). Thus, the highest level of Lyons et al.’s MaaS taxonomy (level 5) is characterised by a system with full

integration of travel modes offering seamless door-to-door journeys without the user needing to spend much cognitive effort. While providing important perspectives on the many challenges of creating seamlessly integrated MaaS services, their taxonomy retains the idea of travelling as essentially being based on rational, informed and choice-making decisions; a perception that is also found in the previously described representations. However, studies indicate that whether potential users adopt MaaS is not only based on a rational evaluation, but also involves, for instance, habit-based heuristics (Schikofsky et al., 2020).

In conclusion, MaaS user practices are represented as anytime-anywhere services that via smartphone apps take over the cognitive efforts associated with planning and carrying out door-to-door integrated and multimodal journeys. The ideal is to have convenient, comfortable and efficient mobility practices. This idea deviates from the practice-theoretical approach, which understands mobility as comprised of routinised and collective practices shaped by elements of materials, competences and meanings and in most cases performed without reflexivity.

## 5. Learning from car sharing in Copenhagen

This section presents and discusses our empirical results. First, we analyse the car sharing practice among the interviewed families focusing on how and for what purpose the car sharing scheme is used. Second, we explore the routines of planning related to car sharing and its wider implications for the families' everyday planning and scheduling. Third, we analyse the role of material elements in car sharing practices. Fourth, we zoom in on experiences of freedom and other benefits associated with car sharing, which distinguishes it qualitatively from private car ownership. For each part of the analysis, we relate our empirical findings to previous studies of MaaS and the MaaS user practice representations (Section 4) in order to identify the key implications for the future design of MaaS solutions that can be drawn on the basis of our empirical study of car sharing.

### 5.1. The performance of car sharing: How and for what?

How the interviewed families perform car sharing as a practice can illuminate how the shift from ownership to access reconfigures everyday practices and points to relevant perspectives in the design of future MaaS solutions. The interviewed families use car sharing for activities like carrying heavy items, shopping of large items, family outings, leisure activities, visiting family and friends, going on holiday etc., but noticeably not commuting or other fixed daily, weekly or monthly activities. Even though car sharing is performed less regularly than everyday commuting, it is still heavily built on routines among all the families. However, the links between car sharing and other everyday practices vary in intensity. Some activities seem strongly connected to car use whereas for other practices, negotiations take place within the families. Carrying heavy items or shopping for large items are examples of practices strongly connected to the use of the car sharing service among most of the families – a relation that can be considered a practice complex. An example of such a practice complex is when shopping trips to IKEA are always done by shared car in Family C or when Family B books a van through the car sharing service to help friends and family that are moving.

Other everyday practices like family outings or visiting family or friends are more loosely bundled with specific mobility practices as all the families shift between going by train or using the car sharing scheme for such trips. The negotiations that take place when choosing between the different modes as well as the routines built around them are in many cases hard to articulate, as exemplified in this quote:

I don't really think we consider it [choosing between train and shared car]. We consider it for [visiting] your parents, should we do

this or that. ... I don't even know how those habits are built. That is a very good question. You don't necessarily think about that. (Family A).

However, some patterns exist across the interviews as the choice of car sharing typically depends on the specifics of the trip. One significant factor for selecting between car sharing and other transport modes is the available infrastructural connections to the destination of the trip. Before finalising the process of car booking, several of the families make an itinerary on the national journey planner "Rejseplanen.dk" to see the available public transport services. When the public transport is inadequate, the shared car becomes the preferred alternative, such as in the case of Rita (Family F) when she plans her hiking routes:

It simply requires a car due to these routes not starting at a train station ... sometimes we [referring to her hiking partner] drive in two different cars because then we park one car where we start and the other car where we end. ... Then, when we come to the end of the route, we drive down to the starting point together. (Family F).

Another important factor involves economising with time and money as resources. For instance, Family A explains that the duration of the visit compared to the duration of the journey itself determines whether they use the car sharing scheme or go by train. For a short visit, they prioritise the shortest possible time spent travelling (i.e. the shared car), whereas for longer visits, spending more time on travelling matters less. This, together with the higher costs for using the shared car, generally makes them prefer to travel by train for longer visits. They feel frustrated for having to pay for the car when it is parked during such visits. This resembles the economising element of pre-trip planning for car sharing observed in the UbiGo trial (Sochor et al. 2016). Hence, car sharing seems to make car use a "limited resource" that calls for careful use, which is related to the pricing structure with payment dependent on time of use.

Also, the spatial sequence of activities plays a role for the choice between car sharing or train. For instance, Family C prefers to take the train when visiting family living far away (in Jutland), but sometimes they use the shared car if they need to go to several places in one trip, because it allows them more flexibility to order their activities in time and space.

A further reason for choosing car sharing in favour of public transport for visits or outings is the need to bring along luggage, which is a challenge of intermodal trips. Families with children especially experience the car as a more convenient alternative to train and bus. As Peter explains:

Because it's just nice to have a car when you have small children ... you don't want to be so scrupulous about packing one or the other thing. 'So, bring those three teddies if you need three teddies.' It's a lot easier! (Family A).

One of the core elements of MaaS is to encourage both multimodal and intermodal trips. This does not consider the need for bringing along luggage, and as such, MaaS is not necessarily well suited to the needs of family life. We suggest that for MaaS to be a successful alternative to private car practices, aspects of everyday life – like the need of bringing along luggage to accomplish family activities – should be taken into account.

### 5.2. Car-booking and pre-scheduling: When?

Although the use of the car sharing scheme is not a recurrent fixed activity, such as commuting, it is often used in situations that can be planned weeks in advance. Typically, the families book the cars for leisure events with friends and families or for more regular visits, such as Family A and D visiting their second homes in Sweden. More irregular uses relate to situations of carrying heavy items (e.g. moving a drum kit or buying paint pails) or, in rare situations, spontaneous decisions of

picking up children from spare time activities or from visits to friends.

This indicates some variety in the periodicity, i.e. whether the practice is conducted with regularity or not, both across families and across the different types of everyday practices for which car sharing is used. Still, the use of the car sharing service is in general planned days ahead, which requires synchronisation with other everyday activities. Thus, car access, in opposition to car ownership, involves more pre-planning and scheduling among family members, as also observed by Sochor et al. 2016. For instance, when visiting friends or family:

Well, it is not something that bothers me a lot, I think, but things need to be planned, you know. You have to decide, okay, when are we going home, and [you have to] make that booking. It makes it a little more inconvenient to stay for an extra day. (Family C).

Similarly, Family A, who used to own an old private car before signing up for the car sharing service, explains how planning summer holidays “is not that free [flexible] compared to if we had our own car. ... We need to plan more. Well in advance, right.” Thus, some families report some inconvenience related to the extra need for planning and coordination of car sharing. A few interviewees even refer to the private car as the ideal choice for families with children, especially if the children are young. For instance, Benny: “I actually think ... Well, if we were to have another kiddie in our family here, then I would definitely get a car again. I think so.” (Family G). However, these stories were not prevalent in the interviews.

Although car sharing increases coordination and planning, none of the families find the need for planning to be a major concern or source of stress. This indicates that the skills of pre-scheduling become an integrated part of everyday practices related to car sharing:

Often, we just sit and talk about what we need and then ‘hey, we just have to remember to book a car’ and then there is someone who just books one. ... It’s part of our everyday life, so to say. (Family A).

When it comes to planning, the main source of annoyance is the fixed time for returning the car. The need to match the exact hours of booking is sometimes experienced as stressful due to the feeling of being in a hurry to get back in due time for car delivery. Reasons for stressful situations can be unexpected traffic congestion or, as indicated in the previous quote from Family C, last minute changes in plans when visiting friends (e.g. deciding to stay overnight). The latter demonstrates how the fixed nature of car sharing booking and preplanning has repercussions for the temporal flexibility related to other everyday practices dependent on the car sharing practice, such as visiting friends. This also marks a key difference between ownership and access to cars.

To accommodate this inflexibility of car sharing, most families have developed different skillsets or workarounds. There is a general tendency to book the cars for more hours than needed to ensure a “buffer” – the longer the trips, the longer the buffer, as exemplified by Family A when booking the car to go to their second home in Sweden:

Well, then we always book the car for something like Sunday midnight ... because you never really know when exactly you get home. ... Then we get home maybe at four o'clock, and when you have dropped off the car, you can go to the app [and unbook – which refunds some of the money paid for the booking]. (Family A).

Another example is Family F, who books extra time both at the beginning and end of the planned trip:

I always put in half an hour before, because I don't know the exact amount of petrol in the car. Then I always calculate some extra time in the end, because if something happens in traffic on the way home, then it is expensive if the car is not back to the next [user]. I think that's fair. ... It would be super annoying to book a car, which was not there. That is why I always put in some extra time. (Family F).

The buffer time has become an integral part of the booking routine

for several families, and even though this extra flexibility costs money, it does not seem to concern these families. To some, it seems to be a deliberate choice to turn their economic surplus, in some cases what they save from the shift from car ownership to access, into increased flexibility. For example:

We need a car maybe once or twice a month. And we decided from the beginning ... now we are not looking at what it costs. Now we just use the car the way we want to use it. (Family E).

Such an attitude to the use of car sharing might very well reflect the economic situation of the families, as they were all middle-class families. However, the interviews also include an example of one family with a more economising approach to the use of car sharing: Family C carefully considers when they will be back from trips and makes sure not to book the car for more hours than needed. Sometimes this results in the feeling of being in a hurry as exemplified by Lars who felt rushed to drop off the car in due time, and who had to ask the other family members to hurry up in order to get home from a visit at some friends. At other times, and instead of rushing home, they choose the opportunity to prolong the booking for an hour or so (rescheduling) when the delivery time approaches.

As shown above, the shift from car ownership to access increases the need for both planning and coordination. A successful use of MaaS will likewise require coordination with others' demands and practices if it incorporates shared mobility solutions that need to be booked in advance. This is something to be considered in designing MaaS schemes. Particularly, the challenge of ensuring flexibility for rescheduling plans is important to consider. Our findings suggest that people will develop different skillsets to cope with this as part of planning their daily life. One might speculate that if car sharing was much more common, this would increase the pool of shared cars and thereby lessen the planning constraints reported above. However, as car sharing is essentially about *sharing* a resource (the car), the access to such cars will by definition be more limited than the access to a privately owned car.

### 5.3. The materiality of car sharing: The car, smartphone and key chip

Most of the interviewed families prefer to use the same car. Mainly because the car is parked close to their home, but to some extent also because they get accustomed to how to operate the car, and therefore, they feel more comfortable using the same car for most trips:

There are incredibly many ways to start a car ... It's not very nice when you are a new driver and nervous about everything. ... I usually drive in the same two cars, so it is only when both are away that I end up in a new one. (Family F).

This illustrates that building familiarity with cars is essential for the use of a car sharing scheme. An implication of this for MaaS systems, including car access, is that these should acknowledge the importance of competence building related to the use of cars.

In order to plan and eventually book a trip, the families use an app or website and are thus required to possess certain information and communication technology (ICT) skills. The use of ICT lifts some of the administration off the shoulders of the car sharing users. The families that have been members of the car sharing scheme for years emphasise how the technical solutions have become a lot smarter in recent years. Now the distance is measured automatically instead of manually filling out a mileage log, and a personal key chip automatically pairs with the booked car making access a lot easier than before. With ICT development, car sharing has become much easier for those possessing these skills, as illustrated by this quote:

Well, you take your phone and open the app and press “book”. So, it's no worse than ordering a pizza. It takes just the same [amount] of time. So no, that's definitely not a problem. It's so easy with the app. (Family E).

However, as pointed out by Pangbourne et al. (2020), MaaS – with its emphasis on ICT-driven solutions – might involve a risk of “technological gentrification” through the seclusion of people having difficulties with handling digital technologies, e.g. due to age. Even among the interviewed families, who seem to belong to a technology-skilled segment of the Danish population, smart apps and smart technologies are by some associated with annoyance and distraction. For instance, Family C expresses their concerns regarding the personal key chip following initial experiences of problems with unlocking the booked car. And both Family D and F book the cars online through the computer because they are tired of smart apps on the phone:

It’s too many little red dots flashing in my hand, I don’t have the energy to care. There is way too much unnecessary information running through these apps. For me, it is the art of restraint. (Family D).

Family F explains that: “All those apps provide access to lots of opportunities, which I don’t need to deal with, so I avoid downloading them.”

Towards the end of the interviews, all families were asked about their immediate reactions to the idea of MaaS and if this would be attractive to them. Interestingly, the families generally state that their current combination of car sharing with other modes of transport (biking, walking and public transport) provides enough flexibility and that a MaaS subscription would not be attractive to them. For instance, Family D:

We don’t need it! Really, we are very well capable of putting our trips together and are able to figure out the necessary trips. (Family D).

Due to the routine character of the families’ mobility practices, and their satisfaction with current service levels, they highlight how they already know which mobility option is best suited for which purpose when they plan their different trips. The interviewed families do not express a need for increased flexibility. The core idea of MaaS is a user-centred system of seamless integration of different mobility modes that is simple, easy and flexible. However, we suggest that the routine character of mobility practices and related everyday practices may stand in opposition to this idea.

However, here it is important to make a comment on the context of our interviews. The bicycling infrastructure is of a high standard in Copenhagen and the public transport system is overall efficient in terms of coverage and integrated, multimodal solutions for travel information and payment. In other cities where access to and the integration and quality of these services are not as good, MaaS may be perceived as a more attractive alternative.

Our findings illustrate how future MaaS is much more than just developing an innovative smart app. First, the design of MaaS will necessarily be dependent on the existing mobility solutions of the specific localities. Second, the user practice representation of MaaS as an anytime-anywhere service that utilises smartphone apps to take over the cognitive efforts of planning door-to-door trips with a high fluidity in choice of transport mode falls short with the practical experiences reported by the car sharing users. These experiences indicate a high level of routinisation, which is not consistent with the idea of mobility as a fluid activity, which easily and without friction can be performed in many ways. The secondary role of journey planning apps in daily trip planning was also observed through interviews of participants in The Sydney MaaS trial, which found that “participants overwhelmingly already decide their mode of transport before using a journey planner to check the schedule” of public transport (Hensher et al., 2021c: 78).

#### 5.4. New opportunities with car sharing: Freedom, community, convenience, economy and the environment

The families associate car sharing with various types of positive

meanings, including a sense of community, climate-friendliness, convenience and freedom. In particular, the sense of freedom appears many times in the interviewees’ sympathetic statements about the car sharing scheme. At first glance, the sense of freedom is primarily tied to the fact of being free from the fixed and current expenses related to owning a car, including maintenance, insurance and parking licenses. All interviewed families report having had considerations about such costs in connection with their decision to subscribe to the car sharing scheme instead of buying a car. Some interviewees had even made detailed calculations of the costs of car ownership:

I simply thought it was too expensive to have a car parked that was not being used. It was also something I was calculating [the price of owning a car versus using car sharing]. ... It would not pay off [to own a car]. (Family F).

Even spreadsheets to compare the expenses of car ownership with car sharing have been in use, as in the case of Family E:

I had sort of calculated meticulously what it cost to have a car for a year and with the driving needs we had, which was less than 5000 km a year. There, we still spent around DKK 30,000 on just having the car. Where it primarily just stands still [is parked]. ... And thus, I thought it might be a little more fun to spend some of that money on something else. (Family E).

Whereas most families said that they saved money compared to having their own car, Family A estimated that they could afford a used car for the money they spent on car sharing. Despite this, they continued with car sharing due to other positive benefits, which were also present in other interviews. One of these is to avoid the inconvenience and time spent on searching for vacant parking spaces as well as regular maintenance of a private car. This is pointed out by most families, such as Family E:

It is in fact very difficult to find those parking spaces, but there are also other things that you have to deal with when you are a car owner. It has to be washed, it has to go to a car workshop, it has to have its tires changed – argh, I thought it was annoying. I don’t have to think about that anymore. Maybe I wash it, but I don’t have to, and I [only] have to fill up petrol once in a while. (Family E).

The interviewed families recurrently refer to the difficulties associated with finding a free parking space as a core incentive to shift to car sharing. Benny recalls how it was to find a vacant parking space when he owned a car:

The challenge was that I was not assured a parking lot [i.e. he had no dedicated parking space], so if you came [home] later than 6 pm, then I drove around and often ended up like one kilometre away [from home] or something like that. And if my partner had driven it, then ‘where the hell was it [parked]?’ (Family G).

Thus, the attractiveness of car sharing is highly determined by the conditions of car ownership within the urban infrastructure. Similar stories were found in interviews with participants in the Swedish MaaS trial EC2B, where Smith (2020) notes that getting “rid of the practical and psychological burdens of car ownership, such as maintenance and the risk of theft” was seen as a benefit by the (previous) car owners taking part in the trial (p. 54). This association of car sharing with convenience seems to be an emerging counter narrative to the traditional narratives – or what Freudendal-Pedersen (2009) has termed structural stories – surrounding the private car as the epitome of (individual) freedom and the natural choice for families with children. In a sustainable transition perspective, such new framings of freedom seem pivotal for changing the powerful norms of private car ownership. Accordingly, Friis (2020) highlights the need to challenge the notion of unlimited freedom permeating the existing private car regime through identifying *whom* and from *where* the power to reframe these norms of



freedom should come from. Our findings suggest how policy interventions, like restricting car parking, can encourage sustainable practices by discouraging unsustainable alternatives (private car driving) through changing the competition between different transport modes with regard to time, space, and resources. This is in line with Spurling and McMeekin's second type of mobility intervention, which focuses on substituting practices through "discouraging current unsustainable practices and replacing them with existing or new alternatives" (Spurling and McMeekin, 2014: 80).

Another positive aspect of car sharing mentioned by all families is the availability of many different types of cars, which makes it possible to book a car that fits specific needs; for instance a van for moving or shopping bigger items (see also Smith, 2020, p. 55, for similar findings). In relation to the availability of many different cars, several families had even developed an almost identical narrative when speaking with friends or others: "we have 60 cars" (Family A) and "we have 100 cars" (Family D).

Environmental and climate-related concerns in favour of car sharing are also mentioned by several of the interviewed families. For instance, several like the idea that shifting from ownership to access reduces the number of cars in the city and thereby releases space for other purposes than car parking:

Well, I also felt guilty about having a car that just stood still and was not used. That's how I felt about the Volvo, that it just stood there and took up space. (Family B).

Finally, the meaning of sharing is another aspect relevant to highlight in relation to MaaS. All families mention a sense of community surrounding the car sharing practice – an *invisible* community, as the users do not know each other. Some families express the feeling of being part of something bigger and explain how they are happy when they discover that the car they usually book is in use. Family A expresses a sense of solidarity with other members when referring to the car sharing service being a non-profit organisation:

It's a nice principle. It's nice to contribute to making it [car sharing] accessible for those who don't have loads of money to spend on it. (Family A).

In opposition to this, the lack of solidarity becomes visible when the families experience discontent with other users, such as witnessing a dirty car, an almost empty tank, or that the car is not delivered in due time. This shows how the shared mobility practice essentially depends on, and is shaped by, trust and interdependency between users and a sense of community and solidarity.

## 6. Conclusion

A key premise of this paper is that exploring how families perform and experience car sharing can inform the design of future mobility schemes, such as MaaS. We will conclude the paper with summarising our key findings and making some analytical points about their implications for the design of MaaS.

Car sharing was mainly used for infrequent trips, such as shopping for big items, visiting friends or family outside Copenhagen, family outings or travelling to the second home. For some types of trips, the shared car would almost always be used, particularly if big items had to be transported or for visits in countryside areas without public transport coverage. For other types of trips, the choice between going by car or public transport was more open and contingent on whether the destination would be available by public transport, the spatial sequence of activities related to the trip, bringing along luggage and economising habits related to time and money. On the whole, our interviews showed that the car sharing scheme was mainly an additional alternative to the families' daily mobility, which was based primarily on biking and to some extent public transport.

Our analysis of MaaS user practice representations showed that current MaaS schemes and literature are anchored in an understanding of everyday mobility as essentially based on rational, informed and choice-making decisions. Consequently, emphasis is put on how MaaS will take over the cognitive efforts associated with planning and carrying out door-to-door multi- and intermodal journeys and provide convenient, comfortable and efficient mobility to its users. This conceptualisation of the travellers and their mobility practices contradicts the findings from our interviews with families using car sharing. First, the interviews show that the routine character of mobility practices might be in opposition to the idea of "ultimate flexibility". Everyday travel is embodied practices that do not change on a regular day-to-day basis. The interviews show that not only are most daily mobilities performed on a routinised basis (e.g. commuting), but the less regular practice of car sharing is typically planned well in advance and follows some regular patterns. In addition, mobility practices are connected with other everyday practices through bundles and complexes, which adds further inertia to the individual practices and enforces the routine character of mobility. The study also found that the idea of MaaS was not appealing to the families; partly because some find it stressful with more mobile apps and more information to digest, which runs counter to the MaaS user practice representations. Thus, contrary to the underlying assumption of the MaaS vision, more apps can actually be experienced as increasing the cognitive efforts related to mobility, whereas routinisation is a way to reduce the cognitive efforts.

The MaaS development is partly shaped by the aim of providing an integrated solution that can compete with the private car in convenience, efficiency and comfortability. While appreciating that MaaS can play a role in the sustainable transition of mobility, we find that creating a seamless MaaS system with the same qualities as owning a private car might be impossible. As the interviews show, private cars offer a level of convenience and flexibility, without the need for constant planning and being dependent on the limitations of shared resources (like shared cars), that will be difficult for MaaS to provide.

Having said that, our findings indicate three ways forward to promote MaaS as an alternative to private car use. *First*, in designing MaaS solutions, the relations between mobility and other everyday practices should be acknowledged. Future MaaS solutions should take into account how mobility is entangled with family life and how this involves, for instance, the need to bring along luggage, purchasing (big) items or taking care of children. As part of this, solutions should ideally be able to accommodate the temporal contingencies of everyday life. For example, when complaining children delay the planned departure to the second home or being caught up in good company with friends (delaying the departure from visits). It is exactly this sort of flexibility and convenience the private car offers, and which the MaaS solution is not able to provide comparatively. Additionally, it is important to study to what extent the dependency on ICT solutions in MaaS can act as a barrier to some people (the digital divide). *Second*, despite the (basic) limitations of MaaS, shifting from car ownership to car access comes with several positive implications, which might provide convenience *in other ways*. Most evident from the interviews is how the families express a sense of freedom from maintenance of a private car (and the costs related to this), as well as the inconvenience and time consumption related to finding parking spaces (which is made easier by the car sharing scheme with its dedicated parking spaces). Also, the modal flexibility of MaaS should ideally make it possible to adapt choice of mode to the specific needs and situations. For example, when having to choose the right shared car model in the specific situation. These types of benefits from MaaS should be highlighted further in order to challenge the narrative of the private car as the ideal mode of transport, especially for families. Together with policies aimed at making private car mobility less attractive (see next), these benefits have the potential to become a new structural story (Freudental-Pedersen, 2009) of car sharing, and MaaS, as the obvious choice for citizens in larger cities. Also, such a new structural story could help challenge and gradually transform the existing cultural

understandings, beliefs and prejudices that Hensher & Mulley (2021) identify as a key barrier for the wider uptake of MaaS. Third, the study suggests that shared mobilities and MaaS will continue to be in intense competition with the private car as long as urban planning, transport infrastructures and policymaking keep favouring private automobility. As Hensher et al. (2020) point out, the evidence so far suggests that MaaS will not be a “game changer”, unless the private car is made less attractive through initiatives such as road-pricing and physical limitations through land-use planning in car traffic and parking. Our interviews especially indicate that the physical layout of cities, including available parking space for private cars, plays a key role for the shift from ownership to access (see also Johansson et al., 2019). This resonates with the theoretical observation by Spurling & McMeekin (2014) that the shift to more sustainable practices, such as less resource-intensive mobility modes, requires not only that sustainable alternatives are available, but also that the existing unsustainable alternatives are restricted by, for instance, limiting the space for automobility and private car ownership in cities.

In a number of recent papers, Hensher and colleagues have raised an important discussion of the feasibility of the past strategies towards developing MaaS from a niche product to a scalable mass service (Hensher & Mulley, 2021; Hensher et al., 2021a; 2022). They identify a number of challenges ranging from the general underestimation of the troubles related to building up an effective and trustful collaboration between the different stakeholders involved in MaaS, over the difficulties in developing service bundles attractive to customers, to acknowledging the need of public intervention and support for sustainable MaaS solutions, e.g. from governments. Hensher and colleagues seem to suggest that there is a need to re-evaluate the effectiveness of the last 5–10 years attempts to create MaaS conceptually and practically, and to explore new, alternative directions of development. Our paper aligns with this thinking and contributes to it through a detailed qualitative study of a car sharing scheme and by employing practice theories as a hitherto almost absent theoretical perspective on shared mobilities and MaaS. Our study gives insight into the everyday dynamics surrounding shared mobilities (car sharing specifically), and our key findings indicate that a further promotion and upscaling of MaaS would, as a minimum, require a shift in policymaking and governance towards limiting (private) car-based traffic, particularly in urban settings, as well as challenging the existing cultural narratives of the private car as the ideal mode of transport.

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The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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