
# Adopting Mobility-as-a-Service: An empirical analysis of end-users' experiences



Citation for the original published paper (version of record):
Smith, G., Sochor, J., Karlsson, M. (2022). Adopting Mobility-as-a-Service: An empirical analysis of end-users' experiences. Travel Behaviour and Society, 28: 237-248.
http://dx.doi.org/10.1016/j.tbs.2022.04.001

Travel Behaviour and Society 28 (2022) 237–248

Contents lists available at ScienceDirect

Travel Behaviour and Society

journal homepage: www.elsevier.com/locate/tbs

# Adopting Mobility-as-a-Service: An empirical analysis of end-users' experiences

Göran Smith [a,b,c,d,e,*], Jana Sochor [a], I.C. MariAnne Karlsson [a]

[a] Design and Human Factors, Chalmers University of Technology, Gothenburg, Sweden
[b] Public Transport and Infrastructure, Region Västra Götaland, Gothenburg, Sweden
[c] K2 - The Swedish Knowledge Centre for Public Transport, Lund, Sweden
[d] Mobility and Systems, RISE Research Institutes of Sweden, Gothenburg, Sweden
[e] Institute of Transport and Logistics Studies, University of Sydney, Sydney, Australia

ARTICLE INFO

*Keywords:*
Mobility-as-a-Service
MaaS
User perspective
Diffusion of innovations
Adoption

ABSTRACT

Despite widespread interest, empirical research on how end-users perceive and use Mobility-as-a-Service (MaaS) is scarce. To address this knowledge gap, this article analyzes the end-user process of adopting a MaaS service entitled EC2B, which was launched in Gothenburg, Sweden, in the spring of 2019. The contribution to the MaaS literature is three-fold. Firstly, the article provides insight into potential end-users by describing the characteristics and motives of the studied group of adopters. Secondly, it improves the understanding of the potential effects of MaaS by outlining how the EC2B service was used and how it influenced travel behavior. Thirdly, the article informs strategies for facilitating MaaS adoption by outlining what types of drivers and barriers the end-users faced during different stages of the adoption process. The reported findings underscore previous assertions that MaaS is much more than just an app and a subscription plan and highlight a mutually reinforcing relationship between the introduction of MaaS and the implementation of policies aimed at reducing car use.

## 1. Introduction

Mobility-as-a-Service (MaaS) is an umbrella term for services that assist people to plan, book, and pay for multiple types of mobility services through a joint digital channel (Smith, 2020; see also Sochor et al., 2018). The term was popularized in Finland in 2014 (Heikkilä, 2014; Hietanen, 2014) and quickly became a main talking point within the global transport sector. Proponents describe it as "the single most powerful tool to decarbonize transport for future generations" (MaaS Global, 2021), "the biggest transport revolution of the 21st century" (SkedGo, 2021), and as "a new paradigm" (Catapult Transport Systems, 2017). MaaS is arguably not a completely new thought pattern that provides a new direction for personal mobility improvements though. Rather, it is an evolutionary continuation of the ongoing digital integration of information relevant for travelers, and thus build on preceding concepts, such as *Advanced Traveler Information Systems* and *Integrated Multimodal Traveler Information* (Lyons et al., 2019).

Yet, in contrast to its predecessors, MaaS embraces disruptive societal trends, such as the rise of the modern sharing economy, and contemporary technologies, such as smartphones (Sochor and Sarasini, 2017). The surrounding rhetoric is also more centered around driving changes in mode choice than previously. The core idea that underpins most MaaS developments is to make it easier for people to complement public transport with other mobility services, such as car sharing, ride-hailing, and e-scooter sharing systems, while the objective is generally to increase the relative attractiveness of using a mixture of shared assets and/or rides to travel versus traveling in private cars.

Historically, approaches with different theoretical underpinnings have been proposed to bring about changes in mode choice and travel behavior (e.g., Batty et al., 2015; Cairns et al., 2008; Graham-Rowe et al., 2011; Santos et al., 2010). One common approach has been to focus on people's attitudes, norms, and knowledge. Initiatives have typically taken the form of travel awareness campaigns (e.g., Garvill et al., 2003), travel information improvements (e.g., Skoglund and Karlsson, 2012), or personalized travel plans (e.g., Brög et al., 2009) with the intent to raise awareness, change attitudes, and to persuade people of the benefits of adopting new travel habits, and thus create voluntary shifts in travel behavior. Encouraging results have been reported, but even though people often have positive attitudes and intend to change, it seems difficult to transform intentions into sustained

* Corresponding author.
*E-mail address:* goran.smith@ri.se (G. Smith).

https://doi.org/10.1016/j.tbs.2022.04.001
Received 8 February 2020; Received in revised form 10 June 2021; Accepted 1 April 2022
Available online 18 April 2022

practice. Several reviews suggest that the long-term effectiveness of this type of intervention is weak (e.g., Bonsall, 2009; Graham-Rowe et al., 2011).

Another approach features interventions that address the contextual factors of traveling (Steg and Vlek, 2009). This includes economic disincentives for car use, such as congestion charging, improvements in preferred modes, such as investments in public transport, and incentives for choosing preferred modes over private car travel, such as free bus tickets (Fujii and Kitamura, 2004). MaaS can arguably be conceptualized as such an approach, based on its anticipated potential to change the context of travel by increasing the awareness of and access to mobility services and by blurring the perceived boundaries between them. For example, MaaS adoption could lead to mode choice becoming more determined by the requirements of individual trips and less by sunk costs in a particular mode (Sochor et al., 2016).

However, just as the effects of interventions that address the contextual factors of traveling generally seem to be less investigated than those of other approaches to changing travel behavior (Strömberg, 2015), the same is true of MaaS. Since 2014, numerous MaaS pilots and operations have been launched across Europe, Asia, Australasia, and North America (see Hensher et al., 2020 for an overview). Yet, apart from publications on one pilot in Gothenburg (e.g., Sochor et al., 2016) and on one in Sydney (e.g., Hensher et al., 2021), few systematic evaluations of how MaaS is used have been reported. Given that MaaS is often described as a user-centric concept (e.g., MaaS Alliance, 2017), there has, moreover, been surprisingly little focus on end-users' lived experiences of MaaS (Lyons et al., 2019). Consequently, the empirical understanding of how introducing MaaS can influence end-users' life situations in general, and their travel behavior in particular, is limited (Karlsson, 2020). Since the end-users' adoption and use of MaaS will ultimately decide the success of the concept, this is arguably an essential missing piece of the MaaS puzzle.

To address this knowledge gap, which is further described in the next section, the objective of this article is to advance the understanding of how end-users perceive and use MaaS. More specifically, it investigates the end-user process of adopting MaaS. The article reports from a mixed-method case study of the adoption/non-adoption of a MaaS service, EC2B, which was launched in Gothenburg, Sweden in the spring of 2019. Utilizing the adoption of this service as a case study, and an amended version of Rogers' (1995) model of end-users' innovation adoption process as the analytical framework, the following research questions are explored: Who has adopted the MaaS service, or not (RQ1); how have adopters used the MaaS service (RQ2); how has adopters' travel behavior been influenced (RQ3); and what types of drivers and barriers have adopters experienced during the adoption process (RQ4)?

## 2. Literature review

The extant knowledge about MaaS users is largely based on quantitative studies of people without experience of using MaaS (see Matyas and Kamargianni, 2021 for an overview)[1]. Many of these studies have focused on understanding who would adopt MaaS if it was available. In terms of the potential market share for MaaS, studies conducted in Finland, Australia, and England have indicated that around 40% of adults would be willing to adopt MaaS, given that all their mobility needs would be covered and that their mobility expenditure would be lowered (Kamargianni et al., 2018; Liljamo et al., 2020; Vij et al., 2020)[2]. Similarly, a seminal stated preference experiment of MaaS uptake conducted in Sydney found that almost half of the respondents would subscribe to a MaaS plan if available (Ho et al., 2018).

Infrequent car users were identified as the most likely adopters of MaaS in the Sydney experiment, while people that either do not use cars or use cars daily were determined unlikely to do so (ibid.). An analysis that compared these results with results from a similar experiment in North East England concluded that the overall likelihood of adopting MaaS is inversely related to the frequency of car use and directly related to the frequency of public transport use (Ho et al., 2020). Several other studies have arrived at similar conclusions (e.g., Matyas and Kamargianni, 2021; Sochor and Sarasini 2017; Tsouros et al., 2021; Zijlstra et al., 2020). Additionally, multi-modal behavior has been pinpointed as a driver for interest in MaaS (e.g., Alonso-González et al., 2020; Polydoropoulou et al., 2020). In contrast, the findings on how car ownership influences MaaS adoption diverge (see Caiati et al. 2020; Matyas and Kamargianni, 2021). Similarly, gender and household composition have proved statistically significant for MaaS adoption in some studies and insignificant in others.

Socio-demographic factors frequently identified to positively influence the propensity to adopt MaaS include living in densely populated areas, being young, being wealthy, and having a high level of digital competence (Sochor, 2021). For instance, Zijlstra et al. (2020) found that "early adopters are likely to be highly mobile, have a high socio-economic status, high levels of education and high personal incomes" (p.197). Zijlstra et al. (2020) also establised that younger adults are more eager to adopt MaaS than older adults (see also Alonso-González et al., 2020; Sochor et al., 2018; Vij et al., 2020), and concluded that overall, the socio-demographic characteristics of likely early adopters of MaaS resemble the general characteristics of early adopters of new technologies (cf. Rogers, 1995). Still, it has been argued that travel habits and attitudes towards different modes of travel are stronger predictors for the uptake of MaaS than socio-demographic variables (Fioreze et al., 2019; Kim et al., 2021)[3].

Several possible explanations as to why the findings on prospective MaaS users vary have been proposed, such as contextual and methodological differences (e.g., Tsouros et al., 2021). Still, the main shortcoming of the stated preference studies arguably relates to the challenge of representing MaaS (cf. Polydoropoulou et al., 2020). Since the respondents generally had no prior experience of MaaS when the studies were conducted, their choices were likely heavily influenced by how the concept was described to them. As MaaS is a multi-faceted concept that is often described in vague language (Smith, 2020), one can assume that the respondents have understood MaaS differently across the studies. Furthermore, "it can be difficult for study participants (or even potential customers) to speculate on not only a new type of service, but also on how well it may or may not meet their transportation needs (which they likely have not reflected upon previously, at least not holistically)" (Sochor, 2021, p.16).

Hence, the few studies that have analyzed actual use of MaaS arguably provide the most well-founded insights into who the MaaS users might be (see Karlsson 2020 for an overview). Strömberg et al. (2018) identified four types of MaaS users in the 2013–2014 UbiGo pilot in Gothenburg: people that wanted cheaper access to public transport (34%), people that wanted access to a car, but not buy one (30%); people that wanted easier access to mobility services (23%); and people that wanted to test a car-free lifestyle (13%)[4]. The UbiGo participants were

[1] For an overview of the entire literature on MaaS, see either Utriainen and Pöllänen (2018) or Wittstock and Teuteberg (2019).

[2] In contrast, only 17% of the participants in a stated preference experiment conducted in Amsterdam and Eindhoven indicated interest in MaaS (Caiati et al., 2020).

[3] The quantiative studies of prospective MaaS users have, moreover, investigated how much people would be willing to pay for MaaS, and what types of mobility bundles and payment models people prefer (e.g., Caiati et al., 2020; Ho et al., 2018; Liljamo et al. 2020; Matyas & Kamargianni 2019; Polydoropoulou et al. 2020; Ratilainen, 2017; Tsouros et al., 2021; Vij et al., 2020).

[4] For descriptions of MaaS user categories based on stated preference studies, see Alonso-González et al. (2020), Fioreze et al. (2019), Matyas and Kamargianni (2021), and Vij et al. (2020).

about 50% male, and around 50% owned cars. Couples and families with children, employed people, and people with a post-high school education were overrepresented, while single person households and older people were underrepresented (Strömberg et al., 2018). Similarly, couples were overrepresented, and older people underrepresented in the 2018–2019 Tripi trial in Sydney (Smith, 2021; Smith et al., 2022). The gender ratio was fairly evenly split in this pilot as well. Compared to the average population of Sydney, the participant group used private cars less, and public transport more, and were less likely to own multiple cars. Still, 91% owned cars and 84% travelled by car at least once a week (ibid.). In contrast to the results from the UbiGo and Tripi pilots, the analyses of the 2014 SMILE pilot in Vienna and of the ongoing operation of Whim in Helsinki indicate that MaaS users thus far are predominantly male and between 20 and 40 years old (Karlsson et al., 2017; Luukkainen 2020). While the majority of SMILE users owned cars, the average Whim user does not.

In sum, the limited available data on actual MaaS users concur with the stated preference studies on the significance of some socio-demographic factors (e.g., age) but are inconclusive regarding for instance whether car owners are more or less interested in MaaS than others. More research into who adopts MaaS is thus warranted (RQ1).

With regard to the use of MaaS and its influence on travel behavior, the empirical evidence primarily stems from three pilots thus far, see Table 1. Based on a pilot in Ghent, Storme et al. (2020) concluded that MaaS should be regarded as a complement to, rather than a supplement of, private cars since the participants did not fully substitute private car use during the pilot despite being given up to €350 to spend on mobility services per month[5]. The participants did reduce their car use though; 74% of the participants, which were all frequent car users, reported that they managed to commute via other means during the pilot. Similarly, a modelling analysis of the Tripi pilot indicated that uptake of the trialed mobility plans reduced private car use (Hensher et al., 2021). 17% of the participants also reported that the experience of participating in the pilot changed their view of car ownership, and 82% were willing to become customers if Tripi would become a commercially available product (Smith, 2021; Smith et al., 2022). Likewise, the participants in the UbiGo pilot in Gothenburg appreciated the piloted service; it helped them try out unfamiliar modes (Strömberg et al., 2016) and made multimodal travelling less expensive and more convenient (Sochor et al., 2015a). 80% of the participants therefore stated that they wanted to continue using it after the pilot (Sochor et al., 2014). UbiGo also promoted changes in travel behavior; 48% of the participants reported a decreased use of private cars during the pilot (Sochor et al., 2015b)[6].

In sum, the three pilots indicate that participants appreciate MaaS and that MaaS uptake can influence travel behavior. Still, the referred papers provide little information on *how* MaaS services are used (RQ2), for instance in terms of trip purposes or with regards to different service components. Furthermore, as the evaluators of all three pilots note that it is difficult to determine the generalizability of their findings, additional analyses of how MaaS uptake influences travel behavior (RQ3) are needed to shed light on if, and if so how, MaaS can promote changes in mode choice.

Finally, in terms of the adoption process, the analysis of the UbiGo pilot in Gothenburg identified curiosity as the strongest driver for MaaS adoption; 63% of the participants identified this as their primary motive at the start of the pilot (Sochor et al., 2014). As the pilot progressed, the curiosity faded, and by the end, convenience and flexibility were the dominant drivers for MaaS use, followed by curiosity and economy. The participants were also motivated to participate in the pilot by the desire to support research, the opportunity to reflect on their travel habits, and the appeal of the MaaS concept (ibid.). The analysis of Whim users reinforced the findings from the UbiGo trial by highlighting price, convenience, flexibility, and the access to different modes as primary motivations (Luukkainen 2020). Interestingly, environmental concerns were not reported as an influential factor by either UbiGo participants or Whim customers. This was not the case in the Tripi trial either. Instead, 43% of the participants reported a desire to contribute to the pilot initiative as their main motive (Smith, 2021; Smith et al., 2022). This was followed by curiosity, more streamlined access to travel modes, and potential cost savings.

All in all, early MaaS adopters seem to be motivated by a combination of curiosity in new technologies and services, a desire to participate in development and research, and the potential to make their travelling cheaper and more convenient. Still, the relative importance of these drivers during different phases of the adoption process has not been analyzed. Furthermore, with the exception of Sochor et al. (2014), few studies have analyzed what factors hold interested people back from adopting MaaS (see also Matyas, 2020). Hence, research into what types of drivers and barriers adopter experience during the adoption process (RQ4) is needed.

## 3. Analytical framework

Adoption can be understood as accepting or beginning to use something new (Adoption, n.d.). Defining innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (p.12), Rogers (1995) outlined a five-stage model for end-users' adoption of innovations: the *knowledge stage* in which the potential adopter is exposed to the innovation and gains an initial understanding of how it functions; the *persuasion stage* in which the potential adopter forms a favorable or unfavorable attitude toward the innovation; the *decision stage* in which the potential adopter engages in activities that lead to a choice to adopt or reject the innovation; the *implementation stage* in which the adopter puts the innovation to use; and the *confirmation stage* in which the adopter seeks reinforcement for the adoption decision already made. Strömberg (2015) used the model to describe people's adoption of new travel behavior but also, based on her research, amended it by distinguishing between two phases of implementation: the *acclimatization phase* during which the adopter experiences and gets a sense of the innovation; and the *normalization phase* during which the adopter tackles how to fit the innovation into his/her circumstance, see Fig. 1.

Rogers (1995), moreover, introduced five interrelated but conceptually different perceived innovation attributes that can speed up the rate of adoption. The best predictor of an innovation's rate of adoption is, according to Rogers, its *relative advantage* from the perspective of potential adopters. In other words, adopters need to perceive the innovation as better than the alternatives, for instance in terms of money, time, social prestige, convenience, or satisfaction. The rate of adoption is also likely to be higher if an innovation exhibits a high degree of *compatibility* with the values, experiences, and needs of potential adopters. In contrast, a low degree of *complexity* is preferable, as the rate of adoption is hampered if potential adopters struggle with understanding the meaning of, and how to use, the innovation. To assign meaning to an innovation and understand how it works under one's own circumstance, adopters often have to try it out. Therefore, a high degree of *trialability* is positively related to rate of adoption (see also Strömberg et al., 2016). Lastly, the perceived *observability* of an innovation supports the rate of adoption. If an innovation and its meaning are easily observed and communicated, more potential adopters are likely to be aware of and persuaded by it.

Adoption is not a binary occurrence, and adopters tend to modify innovations throughout the adoption process (ibid.). It is therefore important to recognize partial adoption as well as different forms of adoption when discussing MaaS adoption (cf. Bayer and Melone, 1989). Additionally, adoption of MaaS arguably involves two interconnected

[5] The participants were also asked to use their cars as little as possible during the pilot (see Storme et al., 2020).

[6] In the SMILE trial, 21% of the participants stated they reduced their use of private cars during the pilot (Karlsson et al. 2017).

**Table 1**
Comparison of the results from three influential MaaS pilots.

| Pilot | Location | Period | Participants | Modes | Incentives | Spending | Private car use |
|---|---|---|---|---|---|---|---|
| UbiGo | Gothenburg, Sweden | November 2013 – April 2014 (6 months) | 195 people, (83 household subscriptions), living in or around Gothenburg | Public transport, car sharing, car rental, taxi & bicycle sharing | Compensation for depreciation of private cars (if so chosen); a new type of public transport ticket & free bicycle sharing membership | €175 per month and participant on average | 20 cars set aside during the pilot; 48% of the participants reported decreased private car use |
| Touring | Ghent, Belgium | April – June 2017 (2,5 months) | 81 people, employed at Ghent University | Public transport, car sharing, car rental, bicycle rental & bicycle sharing | A monthly mobility budget of €150, €250 or €350 per participants which they could spend on mobility services; reimbursement of train tickets | €130 per month and participant on average | 74% of the participants reported that they did not commute by private car during the pilot |
| Tripi | Sydney, Australia | November 2019 – March 2020 (5 months) | 93 people, employed at IAG and working at a Sydney office | Public transport, ride-sourcing, taxi, car sharing & car rental | €12 on average per participant and month distributed through the MaaS plans; €0,65 per participant for every 1% reduction in $CO_2$ emissions during the final month[a] | €217 per month and participant on average | Uptake of MaaS plans reduced private car km; 17% reported changed views of car ownership |

[a] Since the pilot was closed down early, due to the covid-19 pandemic, this incentives scheme was terminated and no rewards were paid out (see Ho et al., 2021 for more details).

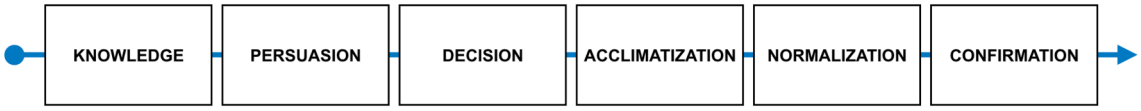


**Fig. 1.** Amended version of Rogers' innovation-decision process, adopted from Strömberg (2015).

processes: the adoption of a new way of travelling, and the adoption of the tools that that mediate the new way of travelling (Strömberg, 2015). Hence, in analyses of MaaS adoption, it is vital to consider conditions that influence travelling in general as well as aspects directly related to adopting the studied MaaS service.

## 4. Case study

Viva is a newly built, resident-owned apartment complex located in a hilly neighborhood approximately 3.5 km from the central station in Gothenburg, Sweden. The apartment complex, which consists of 132 apartments distributed across six buildings, is a result of a long-term collaboration between a commercial housing developer (Riksbyggen), academia, and the City of Gothenburg on so-called positive footprint housing, and is meant to demonstrate how the ecological footprint of housing and living can be reduced. Viva therefore features novel approaches to apartment layouts, building materials, shared resources, and energy supply among other things (Riksbyggen, 2016). Due to this, it has received a considerable amount of media attention and has won several industry awards, such as the 2019 building of the year in Gothenburg. Still, the most notable feature of Viva is arguably that there is no residential car parking; only a few parking spaces for visistors and people with disabilities are provided.

If the standard parking policy for the City of Gothenburg would have been followed, Riksbyggen would have been required to build parking for approximately 60 cars, but following a special study, they struck a deal with the municipality to offer the residents other means for solving their mobility needs instead (City of Gothenburg, 2013). The deviation from the parking policy was counterbalanced with requirements that Riksbyggen provides specified amounts of parking for vistors and people with disabilities, bicycle parking (indoors and near the entrance), and space for mobility services and goods delivery vehicles to stop as well as a car sharing service and parking space for its cars. To ensure that this would meet the needs of the residents, it was, moreover, decided that Riksbyggen must evaluate the parking situation annually in consultation with the municipality for at least five years, and then again after 10 years (ibid.).

Accordingly, Viva features extensive, dedicated bicycle infrastructure including a large-scale garage with a ramp and an elevator, as well as charging facilities and a room with repair stands and tools. Riksbyggen has, moreover, contracted a MaaS operator and several mobility service providers to offer their services at Viva. The residents have access to the EC2B service's app (https//ec2b.se). The app, which was released in February 2019 but still is under development, enables the residents to book and pay for a pool of shared bicycles operated by GoRide (https://goride.se). As of July 2019, this bicycle pool, situated in the bicycle garage, included six electric bicycles (e-bikes), two electric cargo bicycles (cargo bikes), and a three-wheeled electric moped (e-moped). Through the same app, the residents can also buy tickets for regional public transport (https://vasttrafik.se) – two bus stops and a tram stop are within walking distance; and via a link to another app, they can book and pay for Sunfleet (https://sunfleet.se), the largest car sharing service in Sweden – four electric cars are parked outside Viva, and a few other cars of different models are parked within walking distance[7].

Apart from booking and payment functionalities, the app features payment history and occasional discounts for public transport and can be used to access information and customer support. The company that operates EC2B, moreover, invited the residents to participate in workshops when designing the service, and hosted several meetups and coaching sessions after its launch, during which the residents could talk about their travelling, and try out the app and the included mobility services. A summary of key features of the implementation of EC2B at Viva is provided in Fig. 2.

## 5. Method

Data on the residents' processes of adopting (or not) the EC2B service and its various components was primarily collected through household interviews conducted by the lead author (i.e., interviews with one or several members of the household). In total, 31 people from 26 of the 132 households at Viva were interviewed during the spring of 2019.

[7] In 2020, Sunfleet was replaced with OurGreenCar (https://ourgreencar.com), which now has a similar range of cars parked at Viva.

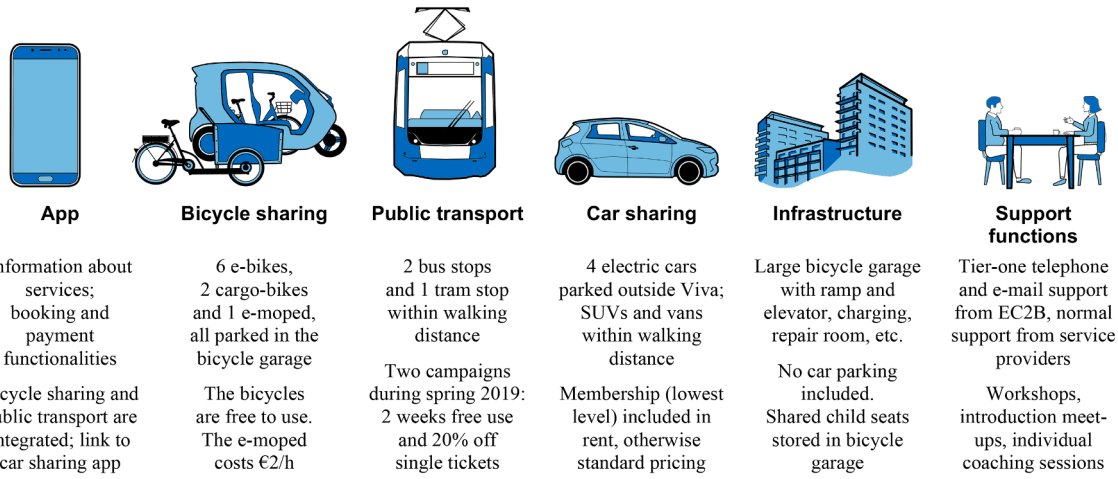


**Fig. 2.** The key features of the implementation of EC2B at Viva.

Follow-up interviews were also conducted with 14 of the 26 interviewed households roughly two months after the initial interviews[8]. The interviews, which with two exceptions (H15 and H22) were held in Swedish, were recorded and lasted about 40 min on average. The interviews followed a semi-structured interview guide that contained six topics: household type and travel patterns; life before moving to Viva; interest in and first impression of EC2B and its components; using the EC2B service; influence on travel behavior; and future use and improvement suggestions.

The interviewees were recruited at two introduction meetups for EC2B and via interview request letters. 19 of 22 households approached during the introduction meetups agreed to be interviewed. Letters sent to the circa 40 households that moved to Viva in February/March 2019 yielded seven additional interviews[9]. As the four final interviews did not provide any new themes deemed significant, the authors judged that thematic saturation was reached, and that no additional interviews were needed, given the explorative objective of the analysis (cf. Guest et al., 2020).

The average age of the interviewees was 49 years, 58% were male. The corresponding numbers for Gothenburg are 39 years and 50% (City of Gothenburg, 2021). Among the adults living at Viva in May 2021 (according to the national population register), the average age was 38 years, 56% were male. Hence, older people, and to some degree men, are overrepresented in the interview sample compared to both the Viva and the Gothenburg populations. Of the interviewed households, 35% were single households and 50% two-person households, while 15% of the households were larger. The corresponding numbers for Gothenburg are 44%, 28%, and 29%, respectively (ibid.). Thus, the share of two-person households in the interview sample are disproportionally large, while single households and families with children are underrepresented. The interviewees owned 12 cars (0.29 per adult). This is less than the average in Gothenburg (0.36 according to ibid.), but more than the average at Viva (0.18 according to Lund et al., 2020). For an overview of the interviewees, see Table 2.

The lead author listened to and transcribed the interview recordings and coded them inductively and thematically. This process encompassed familiarizing with the data, generating initial codes and searching for, reviewing, naming, and summarizing themes (cf. Braun and Clarke, 2006). In total, 485 quotations were generated and categorized into 76 themes, plus seven theme groups of the interviewees' dealings with EC2B: preconditions, drivers, barriers, use, actions, experiences, and effects. This output serves as the primary data source for this article. Quotations from the interviews were carefully translated to English by the lead author to communicate the meaning as understood, and then checked by the second author, who is a native English speaker and fluent in Swedish. The purpose was to make the content available to the non-Swedish speaking reader, with the risk of losing some of the intended meaning.

The interview data was complemented with three types of supplementary data. Firstly, the lead author participated in two introduction meetups that took place in Viva's bicycle garage. Representatives for EC2B and the included mobility services first introduced the app and the mobility services during these events. Thereafter, the residents could get help with registering, downloading the app, booking vehicles, and trying them out. The lead author observed these activities and took notes on the residents' activities, questions, and comments. As exemplified in Section 7, these observations provided a first-hand experience of how barriers of more practical nature (such as the poor internet reception in the garage, the registration process, and the weight of the bicycles) influenced the decision and acclimatization phases.

Secondly, representatives for EC2B offered coaching sessions to the residents. As of July 2019, they had performed 15 of these sessions in person and 31 via phone. Anonymized reports from the sessions were made available for this analysis. The coaches' notes on the residents' reasonings for being interested (or not) in the app and the mobility services and on what questions they asked during the sessions were used to triangulate the frequency of the drivers and barriers that were mentioned during the interviews and/or observed during the introduction meetups, see Table 3. In other words, to assess the generalizability of the identified drivers and barriers across the Viva population, it was counted how often they also came up during the coaching sessions.

Thirdly, booking statistics for the included bicycles and car sharing services as well as for the residents' purchases of public transport tickets through the EC2B app were compiled and reviewed. This information, which is plotted in Fig. 3, was mainly used to confirm how much the mobility services were used by the residents at Viva during the first months. In that capacity, it provided an understanding of how the interviewees' descriptions of their use of the mobility services during the adoption process related to the behavior of the entire Viva population.

[8] Three interviewed households declined to participate in a follow-up interview. The nine remaining households (H19-H26) were interviewed too late to allow for a meaningful follow-up interview within the time frame of the research project.

[9] Roughly a third of the 132 households moved in November/December 2018, a third in February/March 2019, and a third in May/June. Initially, the plan was to focus on the second batch, but such distinctions turned out to be difficult to make in practice.

**Table 2**
Interviewed households.

| Tag | Moved in | Interview | Follow-up | Adults | Age range | Children | Driver's licenses | Vehicles owned | | | User type |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | yy-mm-dd | yy-mm-dd | | | | | Cars | Bikes | E-bikes | |
| H01 | Mar (19) | 19-03-25 | 19-06-24 | 2 | 60–69 | 0 | 2 | 1 | 2 | 0 | Prospective |
| H02 | Mar (19) | 19-03-26 | 19-06-04 | 2 | 20–29 | 0 | 2 | 0 | 1 | 0 | Active |
| H03 | Feb (19) | 19-03-27 | 19-06-07 | 1 | 20–29 | 0 | 1 | 0 | 1 | 0 | Active |
| H04 | Nov (18) | 19-03-27 | 19-06-13 | 1 | 40–49 | 0 | 1 | 1 | 1 | 0 | Active |
| H05 | Mar (19) | 19-04-01 | 19-06-20 | 1 | 20–29 | 0 | 0 | 0 | 1 | 0 | Prospective |
| H06 | Mar (19) | 19-04-01 | 19-06-13 | 2 | 50–59 | 0 | 2 | 0 | 1 | 1 | Active |
| H07 | Nov (18) | 19-04-02 | 19-06-04 | 2 | 70–79 | 0 | 2 | 1 | 0 | 0 | Prospective |
| H08 | Mar (19) | 19-04-03 | - | 2 | 20–29 | 0 | 2 | 1 | 3 | 0 | Prospective |
| H09 | Nov (18) | 19-04-03 | 19-06-18 | 1 | 20–29 | 0 | 1 | 0 | 1 | 0 | Active |
| H10 | Feb (19) | 19-04-03 | - | 2 | 20–29 | 0 | 2 | 0 | 0 | 0 | Prospective |
| H11 | Mar (19) | 19-04-08 | 19-06-05 | 2 | 30–39 | 1 | 2 | 0 | 2 | 0 | Active |
| H12 | Mar (19) | 19-04-09 | 19-06-07 | 1 | 50–59 | 0 | 1 | 1 | 0 | 0 | Prospective |
| H13 | Apr (19) | 19-04-09 | 19-06-24 | 2 | 60–69 | 0 | 2 | 0 | 1 | 0 | Prospective |
| H14 | Mar (19) | 19-04-11 | - | 2 | 20–29 | 0 | 1 | 0 | 0 | 0 | Active |
| H15 | Jan (19) | 19-04-11 | 19-06-20 | 2 | 30–39 | 0 | 1 | 0 | 0 | 0 | Active |
| H16 | Mar (19) | 19-04-26 | 19-06-13 | 1 | 70–79 | 0 | 1 | 1 | 1 | 0 | Prospective |
| H17 | Mar (19) | 19-05-02 | 19-06-19 | 2 | 50–59 | 0 | 2 | 1 | 3 | 1 | Active |
| H18 | May (19) | 19-06-19 | – | 3 | 80–89 | 0 | 2 | 1 | 0 | 0 | Prospective |
| H19 | Feb (19) | 19-06-19 | – | 2 | 70–79 | 0 | 2 | 1 | 0 | 0 | Prospective |
| H20 | Mar (19) | 19-06-20 | – | 2 | 40–49 | 2 | 2 | 0 | 4 | 0 | Prospective |
| H21 | May (19) | 19-06-20 | – | 2 | 60–69 | 0 | 2 | 1 | 2 | 0 | Prospective |
| H22 | Feb (19) | 19-06-20 | – | 2 | 20–29 | 0 | 2 | 0 | 1 | 0 | Prospective |
| H23 | Jun (19) | 19-06-26 | – | 3 | 50–59 | 0 | 2 | 1 | 0 | 2 | Prospective |
| H24 | Jun (19) | 19-06-27 | – | 1 | 50–59 | 0 | 1 | 0 | 1 | 0 | Prospective |
| H25 | May (19) | 19-06-27 | – | 1 | 30–39 | 0 | 0 | 0 | 1 | 0 | Prospective |
| H26 | Nov (18) | 19-06-27 | – | 1 | 40–49 | 0 | 1 | 1 | 0 | 0 | Active |
| **Share of households with at least one** | | | | | | 2/26 | 24/26 | 12/26 | 17/26 | 3/26 | |

## 6. Adoption and use

### 6.1. Who has adopted EC2B (or not) during its first months in operation?

As of July 2019, the EC2B service had 130 registered individual users at Viva. Out of the 26 interviewed households, 23 had downloaded the EC2B app prior to the interview (that is, at least one member in the household). Still, one can argue that all the interviewed households had entered the adoption process to some degree. Everyone was aware of the service and was either using it or considered using it in the future. Two separate user groups emerged nonetheless: *active users* and *prospective users*. Ten of the households had already incorporated the EC2B service as a tool that they actively used to meet their travelling needs, be that frequently or on rare or special occasions (active users), while the other sixteen households were still at an earlier phase of the adoption process, either still considering using EC2B or having only tried out the service once or twice (prospective users).

A few characteristics differentiated the active and prospective user groups, see Table 2. Firstly, the active users had generally lived at Viva for a relatively longer time when they were interviewed. As the adoption process requires time, in particular when the innovation's relative advantage is difficult to determine á priori use, it is not surprising that the households that had moved in earlier had tried and implemented the service to a higher degree. Many of the interviewees commented on this: "*Actually, a few months is probably too short a time span. In a year it might be that we have gotten into it and started seriously using it*" (H18). Secondly, the group of active users included very few older people – only one of the six interviewed households with people either approaching or above retirement age fell into the active user group. Aspects that seemed to influence this included that the older people were less inclined to ride bicycles, had free access to off-peak public transport, and were relatively less tech-savvy (see Section 7). Thirdly, private car ownership seemed to hinder adoption of the service, as only three of the twelve interviewed car-owning households had passed the acclimatization phase (cf. Fig. 1). Essentially, access to a private car often seemed to lessen the perceived need for the EC2B service: "*We have talked about trying the Sunfleet cars as well, but as long as we have our own little car, it's easier to use it*" (H01).

In summary, the majority of the interviewees were aware of EC2B and many had made initial moves such as downloading the app and registering. The analysis indicates that the group that had implemented EC2B as a tool for solving their travel needs (active users) had generally lived at Viva for a relatively longer time, were younger, and were less likely to own private cars, compared to the prospective user group.

### 6.2. How have adopters used EC2B?

The EC2B app was launched in February 2019, but the bicycle and car sharing services had already been in place since around the turn of the year, and were then gradually expanded during the spring as more residents moved in[10]. The interviewees said that their use of the included mobility services increased throughout the spring, especially of the shared cars and e-bikes. As evidenced by the booking statistics, this was also the case for the entire Viva population. In May 2019, the three-wheeled e-moped was introduced, and EC2B began a 20 percent discount on single public transport tickets[11]. These actions caused a spike in the use of these services, see Fig. 3.

Many of the prospective users – i.e., households that were yet to use the mobility services to any significant extent – talked about how they looked forward to using the shared bicycles to transport goods. In particular, they foresaw trips to IKEA with the electric cars and to go grocery shopping with the cargo bikes. Indeed, among the active users, the most frequently reported area of use across all modes was everyday trips related to shopping and errands. The active users used the e-bikes most habitually, for instance to shop at the local grocery store, but some of them preferred either the e-moped or the cargo bikes for longer and hillier trips to the supermarket, and when carrying heavy and bulky items such as large amounts of food or big packages: "*One day, I went to*

[10] Viva's residents can also use the car and bicycle sharing services via GoRide's and Sunfleet's own apps, and were instructed to do so prior to the launch of the EC2B app.

[11] Västtrafik's own app offers a 20 % refund if four single tickets are purchased within a week. This is not included in EC2B.

**Table 3**
Identified drivers and barriers.

| Driver | Description | Frequency | Primary stages |
|---|---|---|---|
| Ambition to drive less | Intent to either use a private car less and/or get rid of it | High | Persuasion |
| Gain access to vehicles | Access to a variety of high-end vehicles | Medium | Persuasion |
| Encouragement | A wish to support a good cause | Medium | Persuasion |
| Curiosity | Interest in learning about and trying new things | High | Decision |
| Saving money | Free trial period for public transport and cheaper tickets | Medium | Decision |
| Saving time and hassle | More flexible, faster, and more direct travelling | High | Normalization |
| Pedalling power and cargo space | Transporting large things and help up the hills | Medium | Normalization |
| Enjoying the rides | Enjoying how biking makes you feel, exercise etc. | Medium | Normalization |

| Barrier | Description | Frequency | Primary stages |
|---|---|---|---|
| Competing assets and habits | Low perceived need for mobility services and/or app | High | Persuasion |
| Insufficient mobility services | Requests for a more comprehensive and flexible system | High | Persuasion |
| Disqualifying factor | Excluded from access or not physically fit enough | Medium | Persuasion |
| Tedious onboarding process | Many separate formulae to fill in and long waiting times | High | Decision |
| Bad timing | A lot of things to do when moving | Medium | Decision |
| Language barriers | All instructions, written and oral, were in Swedish | Low | Decision |
| Hard to learn how it works | A lot of new apps, vehicles, and procedures to learn | High | Acclimatization |
| Scary and bulky vehicles | Difficult to maneuver and park cargo bikes and e-moped | Medium | Acclimatization |
| Poor instructions | Too many and insufficient use instructions | Low | Acclimatization |
| Inadequate booking system | Difficult to operate and incompatible with use patterns | High | Normalization |
| Missing app functionalities | No travel planning or error reporting functions | High | Normalization |
| Difficult to retrieve keys | Poor internet reception in the bicycle garage | High | Normalization |
| Theft and liability | Fear of bicycle theft and burden of responsibility | Medium | Normalization |
| Poor app use experience | Dated appearance and boring and slow to use | Medium | Normalization |
| Wear and tear | Bicycles break downs and helmets disappearing | Medium | Normalization |
| Ambiguous customer support | Unclear who to contact when in need of support | Low | Normalization |
| Bugs and lag | Use problems and concern that the app should not work | Low | Normalization |

*pick up a heavy suitcase. I biked down to the city center to pick it up with the cargo bike. It all went really well*" (H06). One of the interviewees mentioned that his household had not used the electric cars as much as they had anticipated when moving in, basically because they had instead used the e-moped and the e-bikes for shopping errands: "*We have not used the Sunfleet cars much. I thought we would use them more often, but it just does not happen. It is too easy to go by bicycle here in the city*" (H17).

Occasional leisure trips were the second most commonly anticipated area of use of EC2B among the prospective users: "*We have said that if they [friends from out of town] come down and visit us and stay here for a weekend, we could take our [e-]bikes and then rent extra [e-bikes for them]. That is what we have thought, and we have also thought about using that cargo bike [to bike] with the grandchildren*" (H23). One active user had indeed used the cargo bikes to take his grandkids out for rides. Several other active users had, moreover, used the bicycle sharing services for trips such as going to the seaside, to attend dinner parties, or to just head down to the city center to feel 'the vibe of the city'. The majority of these trips were day trips. The car sharing service's SUVs had been used for some weekend trips, but many of the interviewees said that their households had picked up or would be picking up a traditional rental car when going away for more than a day, since that would be cheaper.

A third, less anticipated, category of trips was commuting. Only a handful of the active users had used the e-bikes for this purpose, but these households all did it fairly often. Common reasons included that an e-bike is faster than public transport or a non-assisted bicycle, that it is enjoyable, and that you can use them at night: "*He works night shifts when he is not studying, so then he borrows them at night and bikes to work…… Sometimes, he quits at three or four. Then it is pretty convenient, because the trams might have just stopped [running for the night], but it is super quick for him to bike home instead.*" (H14). Many of the active users who regularly used the e-bikes to commute would have wanted to do it even more frequently. However, as the e-bikes had become more and more popular, the residents could only use the e-bikes about every other day since the booking rules (formal and informal) do not allow multiple bookings at once. A few of the prospective users, moreover, either planned to, or did, use the car sharing service for work-related trips such as going to meetings and picking up clients at the airport.

Regarding more infrequent trips, some active users used the electric cars and the e-moped to pick up visitors at the airport, at the central train station or at one of the more distant tram stops, as well as to pick up household members from late-night activities. Other mentioned trip types included using the e-bike to go to and from sporting/training activities and renting vans from the car sharing service in connection with the move to Viva. Lastly, some used the mobility services just out of curiosity, to see if they liked them and/or to show support for their existence. One of the active users even voluntarily tried to act as an ambassador: "*I have taken out the Zbee [the brand of the e-moped]. Because I see that people do not use it much. I thought that I can drive it a few times so that they see that it is being used*" (H17).

Several of the active users used the mobility services' own apps instead of the EC2B app, stating that they were more used to these and that they had vital features which were absent in the EC2B app (see Section 7). This was true for public transport in particular, but also for the car and bicycle sharing services. The active users that primarily used the EC2B app simply used it as a tool to book, get access to, and pay for the mobility services. The in-app information and support functions did not seem to be used much. Rather, the interviewees relied on learning about the mobility services from the introduction events, the physical information signs in the bicycle garage, and by trying them and the EC2B app out with help from friends, relatives, and neighbors. Some also used the opportunity to book individual coaching sessions. In general, the interviewees were happy with the available support: "*It does not feel like you are left on your own with everything. Rather, it really feels like everyone is very keen on making it work*" (H12).

In summary, a large proportion of the interviewees had downloaded the EC2B app and registered to use it, which they then used, or planned to use, as a tool to access the included mobility services. Many sought assistance when first testing how to book and use the mobility services, at introduction meetings and from helpful neighbors. The use of the mobility services gradually increased, boosted by the introduction of new types of vehicles and public transport discounts. The mobility services were used for a variety of reasons, most notably for everyday trips related to shopping and errands and occasional leisure trips, but also for commuting, picking up people, and out of curiosity.

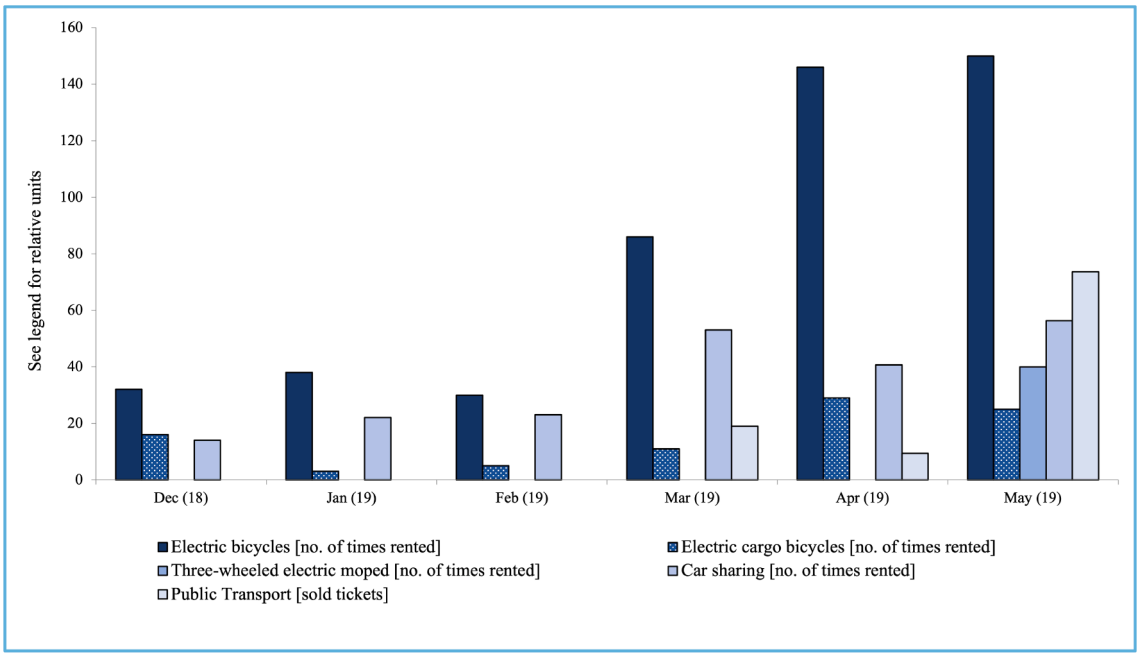


**Fig. 3.** Monthly use of EC2B's mobility services by all Viva residents.

### 6.3. How has adopters' travel behavior been influenced?

A few of the interviewees had moved to Viva from other apartments in the neighborhood. In these cases, they usually said that their travelling had not changed much, as they were able to more or less stick to their old patterns. However, some of them deliberately intended to lower their car use when moving to Viva (see Section 7), and in general many of the interviewees reported reduced car use: "*If you look at it since we moved in here, and compare it to when we lived down in the center, we use it [our car] much, much less*" (H07). The internal motivation to decrease car use, frustration over worsening traffic conditions in Gothenburg caused by ongoing large-scale infrastructure projects, the central location of Viva, and the access to viable alternatives seemed to be the major contributing factors, but the added burden of using their private cars was also regularly brought up during the interviews. Ten of the twelve interviewed car-owning households had rented or borrowed personal parking spaces within walking distance from Viva, while the other two households utilized general street parking. For most of them, this meant that they now had to walk for a few minutes to get to their own cars, and that the process of dropping off things at home, such as groceries, had become more cumbersome than before: "*You think differently. You plan in another way. Now we combine these four errands and run them at the same time instead of one, then two, [and] then the fourth later*" (H21). One interviewee even said that had he had access to residential parking, he would have purchased a car; and two of the interviewed households had gotten rid of their cars when moving to Viva, partly motivated by the lack of residential parking. Nonetheless, a few of the interviewees also reported that the move to Viva might lead to increased car use for them, due to improved car access via the included car sharing service. For some, it even resulted in an increased desire to get a driver's license: "*I have felt that it already has sparked an interest [in getting a driver's license], in some kind of way*" (H05).

The households' former private car use seemed to be mostly replaced with public transport, biking (both electrically assisted and not), and walking, chiefly enabled by the central location of Viva and the access to effective public transport lines. However, EC2B per se seemed to play an important role too – partly by providing access to the mobility services, but also by offering the residents a relatively pain-free way to try out the mobility services and to test whether their households' mobility needs could be met without using a private car. Several prospective users said they planned to try the mobility services first in order to possibly get rid of their private car in the future. A few active users, moreover, said that EC2B had enabled them to discover e-bikes, and that they now considered purchasing one: "*This was only for the start: to test and see if it worked to bike [to the office]. I think it is a great introduction tool for people who have never biked*" (H26). Beyond replacing car trips, the active users also mentioned replacing walking, non-assisted biking, and public transport by using the car and bicycle sharing services.

When asked to comment on the perceived effects of their access to EC2B, the active users that did not own cars primarily mentioned two interrelated things. Firstly, they said that the included mobility services spared them time and hassle. Had they not had access to the services, they would have either skipped desired activities such as going on picnics or shopping at the eco-friendly grocery store in the city center, or performed these trips with public transport, which would have been more time-consuming, less practical, and not as enjoyable: "*I would have planned my life after bus times, as you do, instead of having this freedom of the bicycle alternatives*" (H03). Secondly, a few of the active users noted that the mobility services made them feel more independent and less constrained. For instance, the car sharing service enabled one newly arrived student who did not know many people in the city to drive to away games with her bandy[12] team when it is her turn to drive, and permitted a family that did not want to own a car to shop for furniture for the apartment: "*We have not had any car, but we do not feel restricted. That is what is important, right? If so, we just rent a Sunfleet car*" (H11).

In summary, many of the interviewed car-owning households at Viva used their cars to a lesser degree compared to how they travelled prior to moving. The central location of the apartment complex, the longer distance to parking for private cars, and the access to public transport seem to have been important factors for this shift, alongside an individual motivation to change. Still, the access to EC2B appears to have played a role as well as it provided access to a range of viable alternative modes and a smooth way to trial them. For the non-car-owning households, the mobility services included in EC2B reduced travel time and

[12] Bandy is a team sport played on ice where skaters use bandy sticks to direct a ball into the opposing team's goal.

hassle and provided a sense of independence.

## 7. Drivers and barriers

This section reports what drivers and barriers the interviewees experienced during the different conceptual stages of the adoption process outlined in the analytical framework. As all the interviewees knew about EC2B (knowledge), but had not yet established new travel habits[13], they mostly talked about forming attitudes (persuasion), deciding to use EC2B or not (decision), initiating use (acclimatization), and starting to normalize behavior (normalization). A summary of the identified drivers and barriers, categorized according to the closest related adoption stage, including how frequently they were mentioned in the interviews and during the coaching sessions, is provided in Table 3 and discussed hereafter.

In the persuasion stage – in which the potential adopter forms a favorable or unfavorable attitude toward the innovation – the residents formed initial attitudes towards EC2B. This process was largely influenced by the perceived relative advantage of EC2B compared to other means of travelling, and EC2B's compatibility with the household's mobility needs. Here, primary drivers included a desire and deliberate intent to drive less, a wish to support the existence of the mobility services (for the benefit of themselves, their neighbors, research, and/or the environment), as well as the possibility to gain access to modern and sometimes high-end vehicles: "*I can, with a probability of 100%, say that we never will buy such bicycles. We will not buy expensive e-bikes. But we will use them*" (H20). Barriers included private cars and bicycles as well as a perceived need for car trips, which were deemed infeasible to execute with shared vehicles, such as car commuting and long, one-way trips on weekends or during holiday seasons. Quite a few interviewees also did not feel physically capable of cycling in the city, and some wanted to use the car sharing service, but were not accepted as members. This included, of course, the people that did not have a valid driver's license, but also one interviewed student who did not have a sufficient credit score. The attitude towards adopting the EC2B app was, moreover, for some, negatively influenced by their familiarity and satisfaction with the included mobility services' own apps: "*For the bicycles I use the bicycle app: GoRide. It was the one I downloaded first, so that's the one I got a little bit accustomed to. It is simple and fast. It has what I need. So it has become that way*" (H09).

The decision stage, in this case when the residents initiated use by booking a vehicle or purchasing a public transport ticket, was largely driven by curiosity. The curiosity was, among other things, triggered by the new, noticeable, and visibly parked vehicles, and by all the information about the setup that had been distributed. The mobility services were, moreover, seen by the interviewees as an important piece of the puzzle in Viva's appreciated innovation and sustainability profile: "*Imagine picking up [disclosed name] in the Zbee without saying anything first. It would be a lot of fun. Because we have advertised it; told them about all of this.*" (H23). The two promotional campaigns for public transport (20% off on single tickets and two weeks free use) seemed to be effective in getting the residents to start using the EC2B app. However, while many prospective users said they wanted to try the mobility services, it was not their first priority. The move to Viva meant that they had a lot on their plates and many other new things to figure out. The multi-step process of getting access to the app, setting up accounts for the bicycle and car sharing services, and to register payment card details for public transport was perceived as tedious and did not make the move easier for them on the whole. Many residents asked for help with these matters during the introduction meetups and the coaching sessions, and overall, this made taking the step from wanting to use it to actually using it difficult and time consuming, especially for the non-native speakers: "*The GoRide, the instructions in the manual for Sunfleet – everything is in Swedish…… and also, we signed an acceptance paper and tried to register, but I need to wait for an e-mail. So, it is not easy: I need to really, really want this [to adopt it]"* (H22).

Still largely driven by curiosity in the acclimatization stage – during which the adopter experiences and gets a sense of the innovation and its details – the residents started to get to know the EC2B service and its practicalities, such as booking and opening the electric cars, picking up keys for the bicycles, and maneuvering the vehicles. Many of the interviewees experienced the first steps in this phase as challenging. In general, they found it fairly difficult to learn and remember how to operate the various aspects of the EC2B service, including the app, vehicles, and procedures. The scattered and difficult-to-follow instructions were not helpful either: "*Compared to other car sharing services I have used, it is a little clunky. And there is not great documentation to explain how to go through your first steps and find all of the pieces*" (H15). Consequently, many residents used the coaching session to ask for help on how to navigate the app and access and use the included mobility services. The first interactions with the cargo bikes and the e-moped, moreover, left a few of the interviewees a bit scared, as they found it hard to turn with the cargo bike and experienced the e-moped rides as somewhat uncomfortable and dangerous. The parking and locking procedures for these and the e-bikes were also perceived as tiresome. For instance, at the introduction meetups, quite a few residents struggled with finding and handling the three separate locks used for the cargo bikes.

When beginning to use EC2B on a more regular basis in the normalization stage – during which the adopter tackles how to fit the innovation into his/her circumstance – the main perceived benefits of the service served to increasingly motivate those who had managed to come that far in the adoption process (i.e., active users). These benefits were the ability to transport large and heavy items up the hills to Viva, enjoying using the vehicles, and especially saving time and hassle by being able to travel more flexibly, faster, and more directly from A to B compared to with other modes. As to barriers, this was the phase when the aspects that hindered effective use of the mobility services really came into play. In particular, the active users complained about the booking system, which did not permit them to select specific bicycles and extend bookings, and the pickup of keys for the e-bikes, which was time consuming due to poor internet reception in the bicycle garage and a repetitive confirmation procedure. Overall, the interviewees thought that the design of the EC2B app was dated, and that missing functionalities, such as error reporting, discouraged use: "*They may need to develop it a bit so that it has all the functions. Otherwise, it is easy to choose the usual apps*" (H08). Those who used the bicycle sharing service regularly, moreover, worried about thieves as well as wear and tear of the e-bikes. One interviewee speculated that this drove up the operation costs to an unsustainable level: "*I am guessing that different parties are putting in money to make it work, also the guy that manages the bicycles. When we are supposed to fund this from the resident board, it might become too expensive to have it like this*" (H06).

In summary, the interviewees' processes of forming attitudes towards EC2B in the persuasion stage were largely driven by internal ambitions to drive less, and the possibility to gain access to a variety of vehicles, while they were hindered by a perceived need for either long or frequent car trips, neither of which was perceived as well-matched with the mobility services included in EC2B. The decision and acclimatization processes were characterized by curiosity on one hand, and a tedious onboarding process and a complex system to learn on the other. In the normalization stage, the perceived benefits of using the included mobility services were increasingly important as drivers, while the annoyances with the barriers that hindered effective use of the mobility services grew.

[13] A few of the active users indicated that they had established habits of using the service. However, considering that the app was still under development (etc.) and that they were yet to experience winter, we view them as still being in the normalization phase.

## 8. Discussion

It is next to impossible to determine the relative contribution of different components to the adoption (or not) of EC2B. Rather, the successful instances of adoption seem to be influenced by a combination of: (i) the decreased attractiveness of traveling by privately owned cars largely due to poor parking options at Viva, worsening traffic conditions in Gothenburg, and a greater awareness of negative externalities from car traffic; (ii) the increased attractiveness of traveling via other means, because of the location and design of Viva as well as the introduction of new mobility services; and (iii) the opportunity to easily trial new travel behavior due to the introduction of EC2B.

At least two conclusions can be drawn from this finding. Firstly, MaaS is much more than an app and a subscription plan. Based on the 2013–2014 UbiGo trial, Karlsson et al. (2016) concluded that: "Merely introducing an app, or multimodal information or integrated payment solutions will not suffice in order to develop a successful MaaS…… [A] 'service of the service' must be developed too" (pp. 3270–3271). This case study reinforces this conclusion by emphasizing the significance of design decisions related to, for instance, the onboarding process, instructions for use, user responsibilities, support functions, and even physical and practical solutions, see Table 3.

Secondly, the analysis reveals a possible mutually reinforcing relationship between the (synchronized) introduction of MaaS and the implementation of policies aimed at reducing car use. In the studied case, the lack of residential parking at Viva made the interviewees evaluate their private car ownership and use and increased their interest in trialing alternative options. At the same time, several interviewees said that the introduction of EC2B and its components made them comfortable with moving to Viva despite its lack of residential parking. In general, both adopters and non-adopters appreciated the existence of EC2B. Thus, it seemed to add value to the Viva property.

Much of the existing MaaS literature has focused on how to assist and govern MaaS developments (e.g., Audouin and Finger, 2018; Hirschhorn et al., 2019: Li and Voege, 2017; Pangbourne et al., 2018, 2020; Smith, 2021; Smith et al., 2019; Smith et al., 2022). This study complements these works by reporting on end-user experiences, which can inform viable strategies for how to facilitate MaaS adoption. Drawing on the perceived attributes of innovation outlined by Rogers (1995), and the drivers and barriers experienced by the interviewees at Viva, we propose five design strategies that can potentially facilitate MaaS adoption.

Firstly, increase the *relative advantage* of MaaS by implementing transport polices that make it more cumbersome and costly to own and use private cars. In this study, it was evident that the reduced parking opportunities played a key role in making the Viva residents interested in alternatives to private car ownership and use. Secondly, improve the *compatibility* of MaaS by targeting groups that have previously indicated interest in the sharing economy and/or sustainability-branded innovations, such as the residents at Viva, and by making the MaaS services flexible enough to enable adopters to customize the services to fit with their current travel needs and habits. In this study, for example, the inflexibility of the booking system for the bicycle sharing system made it mismatched with the needs of those who wanted to plan their commuting several days in advance as well as with those who wanted to extend their trips on a whim. Thirdly, reduce the *complexity* of MaaS by minimizing the volume of new digital systems and apps, practical procedures, and pricing models the adopters have to learn and manage. Many of the interviewees had a hard time understanding the EC2B service and its components, which made them more reluctant to use it. Fourthly, improve the *trialability* of MaaS by making the onboarding process quick and simple, and through promotional discounts. Due to having to download multiple apps, register in multiple systems, and learn multiple new procedures at once, a majority of the interviewees experienced the on-boarding process as challenging, although, in April and May, this barrier was partly offset by the concrete, monetary incentive of the public transport ticket campaigns (see also Strömberg et al., 2016). Fifthly, increase the *observability* of MaaS by including eye-catching vehicles, parked where they are easily seen. At Viva, the large bicycle garage placed by the entrance of the buildings and the noticeable cargo bikes and e-moped helped the residents notice and build up interest for EC2B and the included mobility services.

Finally, even though Viva also comprises a small number of low-priced apartments reserved for residents aged 30 or less, most apartments are quite pricy. As of July 2019, the average price per square meter for the 31 apartments at Viva sold during the previous twelve months exceeded the Gothenburg average by 25% (Hemnet, 2019; Mäklarstatistik, 2019). Hence, most residents at Viva are probably either quite well-off, or have affluent relatives. Due to the innovation and sustainability profile of Viva, one can also suspect that the Viva residents are relatively more interested in new mobility solutions, such as MaaS. Viva, moreover, features no residential parking, is centrally located, and the access to car sharing and the public transport network is better than average (at least in West Sweden). All of these traits make the studied case atypical in the sense that the conditions for adoption are auspicious compared to when MaaS targets the general population of a given area, such as in the cases of the ongoing adoptions of Jelbi in Berlin (jelbi.de) and Whim in Helsinki (whimapp.com). As atypical case studies have been found to generally activate more actors and more basic mechanisms and therefore reveal rich information (Flyvbjerg, 2006), we argue that the findings and conclusions reported in this article should not be interpreted as directly transferable to all MaaS cases[14]. Rather, we hold that this case study is well suited to serve as an entrée into understanding MaaS adoption processes (cf. Seawright and Gerring, 2008), and to inform viable strategies for facilitating MaaS adoption, particularly among the people that Rogers (1995) categorizes as innovators and early adopters. To better understand the needs of the people that fall into the early majority, late majority, and laggard categories (see ibid.), and thus how wider MaaS adoption can be facilitated, more long-term analyses of the adoption (or not) of MaaS services that target more representative populations are needed.

## CRediT authorship contribution statement

**Göran Smith:** Conceptualization, Methodology, Investigation, Formal analysis, Writing – original draft. **Jana Sochor:** Supervision, Writing – review & editing. **I.C. MariAnne Karlsson:** Supervision, Writing – review & editing.

## Declaration of Competing Interest

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.

## Acknowledgements

Region Västra Götaland and K2 – The Swedish Knowledge Centre for Public Transport funded the reported study. Additionally, the revision of the article was supported by the Swedish Energy Agency through the SEAMLESS project. The study was made possible by helpful representatives at Riksbyggen, EC2B AB, Västtrafik AB, Sunfleet AB and GoRide AB. We want to thank them, as well as all the residents at Viva who devoted their valuable time to us. An earlier version of the article was presented at the 2nd International Conference on Mobility-as-a-Service in Tampere in December 2019. We are grateful for the positive and high-quality feedback we received from reviewers and conference attendees. Finally, we are thankful to Professor Donggen Wang and the anonymous referees at Travel Behaviour and Society for constructive

[14] Or even to the entire Viva population, given the skewness of the sample discussed in Section 5.

comments that helped us improve the arguments in this article.

## References


Adoption. (n.d.). In *Cambridge Academic Content Dictionary*: Cambridge Academic Content Dictionary, Cambridge: Cambridge University Press.

Audouin, M., Finger, M., 2018. The development of Mobility-as-a-Service in the Helsinki metropolitan area: A multi-level governance analysis. Res. Transport. Bus. Manage. 27, 24–35. https://doi.org/10.1016/j.rtbm.2018.09.001.

Alonso-González, M.J., Hoogendoorn-Lanser, S., van Oort, N., Cats, O., Hoogendoorn, S., 2020. Drivers and barriers in adopting Mobility as a Service (MaaS)–A latent class cluster analysis of attitudes. Transport. Res. Part A: Policy Practice 132, 378–401. https://doi.org/10.1016/j.tra.2019.11.022.

Batty, P., Palacin, R., González-Gil, A., 2015. Challenges and opportunities in developing urban modal shift. Travel Behav. Soc. 2 (2), 109–123. https://doi.org/10.1016/j.tbs.2014.12.001.

Bayer, J., Melone, N., 1989. A critique of diffusion theory as a managerial framework for understanding adoption of software engineering innovations. J. Syst. Softw. 9 (2), 161–166. https://doi.org/10.1016/0164-1212(89)90018-6.

Braun, V., Clarke, V., 2006. Using thematic analysis in psychology. Qualitative Res. Psychol. 3 (2), 77–101. https://doi.org/10.1191/1478088706qp063oa.

Bonsall, P. (2009), What is so Special about Surveys Designed to Investigate the Environmental Sustainability of Travel Behaviour? In: Bonnel, P., Lee-Gosselin, M., Zmud, J. and Madre, J.-L. (Ed.) *Transport Survey Methods*, 49-69, Bingley: Emerald Publishing. https://doi.org/10.1108/9781848558458-003.

Brög, W., Erl, E., Ker, I., Ryle, J., Wall, R., 2009. Evaluation of voluntary travel behaviour change: Experiences from three continents. Transp. Policy 16 (6), 281–292. https://doi.org/10.1016/j.tranpol.2009.10.003.

Caiati, V., Rasouli, S., Timmermans, H., 2020. Bundling, pricing schemes and extra features preferences for mobility as a service: Sequential portfolio choice experiment. Transport. Res. Part A: Policy and Practice 131, 123–148. https://doi.org/10.1016/j.tra.2019.09.029.

Cairns, S., Sloman, L., Newson, C., Anable, J., Kirkbride, A., Goodwin, P., 2008. Smarter choices: assessing the potential to achieve traffic reduction using 'soft measures'. Transport Rev. 28 (5), 593–618. https://doi.org/10.1080/01441640801892504.

Catapult Transport Systems (2017). Mobility as a Service: A New Paradigm. Retrieved from: https://ts.catapult.org.uk/2017/08/14/mobility-service-new-paradigm/ (2021-06-10).

City of Gothenburg (2013). Detaljplan för Bostäder mm vid Dr Allards gata inom stadsdelen Guldheden i Göteborg. https://goteborg.se/wps/portal/start/byggande–lantmateri-och-planarbete/kommunens-planarbete/plan–och-byggprojekt?uri=gbglnk%3Agbg.page.bb7386fd-1152-47cb-9da4-d06bd7780a77&projektid=BN0593%2F11.

City of Gothenburg (2021). Statistikdatabas Göteborgs Stad ('folkmängd 2020', 'hushåll 2020', and 'personbilar 2020') Retrieved from: http://statistikdatabas.goteborg.se/pxweb/sv/ (2021-05-28).

Fioreze, T., De Gruijter, M., Geurs, K., 2019. On the likelihood of using Mobility-as-a-Service: a case study on innovative mobility services among residents in the Netherlands. Case Stud. Transport Policy 7 (4), 790–801. https://doi.org/10.1016/j.cstp.2019.08.002.

Flyvbjerg, B., 2006. Five misunderstandings about case-study research. Qualitative inquiry 12 (2), 219–245. https://doi.org/10.1177/1077800405284363.

Fujii, S., Kitamura, R., 2004. Drivers' mental representation of travel time and departure time choice in uncertain traffic network conditions. Networks Spatial Econ. 4 (3), 243–256. https://doi.org/10.1023/B:NETS.0000039781.10517.3a.

Garvill, J., Marell, A., Nordlund, A., 2003. Effects of increased awareness on choice of travel mode. Transportation 30 (1), 63–79. https://doi.org/10.1023/A:1021286608889.

Graham-Rowe, E., Skippon, S., Gardner, B., Abraham, C., 2011. Can we reduce car use and if so, how? A review of available evidence. Transport. Res. Part A: Policy Practice 45 (5), 401–418. https://doi.org/10.1016/j.tra.2011.02.001.

Guest, G., Namey, E., Chen, M., Soundy, A., 2020. A simple method to assess and report thematic saturation in qualitative research. PLoS ONE 15 (5), e0232076.

Heikkilä, S. (2014). *Mobility as a service - a proposal for action for the public administration, case helsinki.* (Master's thesis), Aalto University, Aalto. https://aaltodoc.aalto.fi/handle/123456789/13133.

Hemnet. (2019). Slutpriser bostäder - doktor allards gata, göteborgs kommun. Retrieved from: https://www.hemnet.se/salda/bostader?location_ids%5B%5D=689430 (2019-07-16).

Hensher, D.A., Ho, C.Q., Reck, D.J., 2021. Mobility as a Service and private car use: evidence from the Sydney MaaS trial. Transport. Res. Part A: Policy Practice 145, 17–33. https://doi.org/10.1016/j.tra.2020.12.015.

Hensher, D.A., Mulley, C., Ho, C., Wong, Y., Smith, G., Nelson, J.D., 2020. Understanding Mobility as a Service (MaaS): Past, Present and Future. Elsevier.

Hietanen, S., 2014. 'Mobility as a service' – the new transport model? ITS & transport management supplement. Eurotransport 12 (2), 2–4. https://silo.tips/download/sampo-hietanen-ceo-its-finland.

Hirschhorn, F., Paulsson, A., Sørensen, C.H., Veeneman, W., 2019. Public transport regimes and mobility as a service: Governance approaches in Amsterdam, Birmingham, and Helsinki. Transport. Res. Part A: Policy Practice 130, 178–191. https://doi.org/10.1016/j.tra.2019.09.016.

Ho, C.Q., Hensher, D.A., Mulley, C., Wong, Y.Z., 2018. Potential uptake and willingness-to-pay for Mobility as a Service (MaaS): A stated choice study. Transport. Res. Part A: Policy and Practice 117, 302–318. https://doi.org/10.1016/j.tra.2018.08.025.

Ho, C.Q., Hensher, D.A., Reck, D.J., 2021. Drivers of participant's choices of monthly mobility bundles: Key behavioural findings from the Sydney Mobility as a Service (MaaS) trial. Transport. Res. Part C: Emerg. Technol. 124, 102932.

Ho, C.Q., Mulley, C., Hensher, D.A., 2020. Public preferences for mobility as a service: Insights from stated preference surveys. Transport. Res. Part A: Policy Practice 131, 70–90. https://doi.org/10.1016/j.tra.2019.09.031.

Kamargianni, M., Matyas, M., Li, W., & Muscat, J. (2018). Londoners' attitudes towards car-ownership and Mobility-as-a-Service: Impact assessment and opportunities that lie ahead. https://www.maaslab.org/reports.

Karlsson, I. C. M. (2020). Mobility-as-a-Service: Tentative on users, use and effects. In: Krömker, H. (Ed.) HCI in Mobility, Transport and Automotive Systems: Driving Behavior, Urban and Smart Mobility. HCII 2020. *Lecture Notes in Computer Science*, 12213, 228-237. https://doi.org/10.1007/978-3-030-50537-0_17.

Karlsson, I. C. M., Sochor, J., Aapaoja, A., Eckhardt, J., & König, D. (2017). Deliverable 4: Impact Assessment. *MAASiFiE project funded by CEDR*.

Karlsson, I.C.M., Sochor, J., Strömberg, H., 2016. Developing the 'service'in mobility as a service: Experiences from a field trial of an innovative travel brokerage. Transp. Res. Procedia 14, 3265–3273. https://doi.org/10.1016/j.trpro.2016.05.273.

Kim, Y., Kim, E.J., Jang, S., Kim, D.K., 2021. A comparative analysis of the users of private cars and public transportation for intermodal options under Mobility-as-a-Service in Seoul. Travel Behav. Soc. 24, 68–80. https://doi.org/10.1016/j.tbs.2021.03.001.

Li, Y., Voege, T., 2017. Mobility as a service (maas): Challenges of implementation and policy required. J. Transport. Technol. 7 (2), 95–106. https://doi.org/10.4236/jtts.2017.72007.

Liljamo, T., Liimatainen, H., Pöllänen, M., Utriainen, R., 2020. People's current mobility costs and willingness to pay for Mobility as a Service offerings. Transport. Res. Part A: Policy Practice 136, 99–119. https://doi.org/10.1016/j.tra.2020.03.034.

Lund, E., Larsson, F., Adell, E. (2020). Mobilitetstjänsten EC2B i det bilfria boendet Brf Viva Erfarenheter från det första året https://docplayer.se/206858980-Mobilitetstjansten-ec2b-i-det-bilfria-boendet-brf-viva-erfarenheter-fran-det-forsta-aret.html.

Lyons, G., Hammond, P., & Mackay, K. (2019). The importance of user perspective in the evolution of maas. *Transport. Res. Part A: Policy Practice, 121*, 22-36. https://doi.org/10.1016/j.tra.2018.12.010.

Luukkainen, P. (2020). Moving on a Whim-Customer Value Creation in MaaS. (Master's thesis), Aalto University, Aalto. https://aaltodoc.aalto.fi/handle/123456789/45371.

MaaS Alliance (2017). White paper: Guidelines & recommendations to create the foundations for a thriving MaaS ecosystem. https://maas-alliance.eu/wp-content/uploads/sites/7/2017/09/MaaS-WhitePaper_final_040917-2.pdf.

MaaS Global (2021). What is MaaS Global? Retrieved from: https://whimapp.com/about-us/ (2021-05-04).

Matyas, M., 2020. Opportunities and barriers to multimodal cities: Lessons learned from in-depth interviews about attitudes towards mobility as a service. Eur. Transport Res. Rev. 12 (1), 7. https://doi.org/10.1186/s12544-020-0395-z.

Matyas, M., Kamargianni, M., 2019. The potential of mobility as a service bundles as a mobility management tool. Transportation 46 (5), 1951–1968. https://doi.org/10.1007/s11116-018-9913-4.

Matyas, M., Kamargianni, M., 2021. Investigating heterogeneity in preferences for Mobility-as-a-Service plans through a latent class choice model. Travel Behav. Soc. 23, 143–156. https://doi.org/10.1016/j.tbs.2020.12.002.

Pangbourne, K., Stead, D., Mladenović, M., Milakis, D., 2018. The case of mobility as a service: a critical reflection on challenges for urban transport and mobility governance. In: Marsden, G., Reardon, L. (Eds.), Governance of the Smart Mobility Transition. Emerald Publishing, Bingley, pp. 33–48. https://doi.org/10.1108/978-1-78754-317-120181003.

Pangbourne, K., Mladenović, M.N., Stead, D., Milakis, D., 2020. Questioning mobility as a service: unanticipated implications for society and governance. Transport. Res. Part A: Policy and Practice 131, 35–49. https://doi.org/10.1016/j.tra.2019.09.033.

Polydoropoulou, A., Tsouros, I., Pagoni, I., Tsirimpa, A., 2020. Exploring individual preferences and willingness to pay for mobility as a service. Transp. Res. Rec. 2674 (11), 152–164. https://doi.org/10.1177/0361198120938054.

Ratilainen, H., 2017. Mobility-as-a-Service: Exploring consumer preferences for MaaS subscription packages using a stated choice experiment. (Master's thesis), Delft University of Technology, Delft.

Riksbyggen. (2016). *Länge leve brf viva*. Retrieved from: https://www.riksbyggen.se/globalassets/1-riksbyggen/bostad/bostad/referensprojekt/brf-viva-referensprojekt/bofakta_brf_viva_web.pdf (2021-06-10).

Rogers, E.M., 1995. Diffusion of Innovations. Simon and Schuster, New York.

Santos, G., Behrendt, H., Teytelboym, A., 2010. Part II: Policy instruments for sustainable road transport. Res. Transport. Econ. 28 (1), 46–91. https://doi.org/10.1016/j.retrec.2010.03.002.

Seawright, J., Gerring, J., 2008. Case selection techniques in case study research: A menu of qualitative and quantitative options. Polit. Res. Quarterly 61 (2), 294–308. https://doi.org/10.1177/1065912907313077.

SkedGo (2021). Mobility-as-a-Service: The biggest transport revolution of the 21st century. Retrieved from: https://skedgo.com/what-is-mobility-as-a-service-maas/ (2021-05-04).

Skoglund, T., Karlsson, I.M., 2012. Appreciated–but with a fading grace of novelty! traveller's assessment of, usage of and behavioural change given access to a co-modal travel planner. Procedia-Soc. Behav. Sci. 48, 932–940. https://doi.org/10.1016/j.sbspro.2012.06.1070.

Smith, G. (2020). Making mobility-as-a-service: towards governance principles and pathways. (Doctoral thesis), Chalmers University of Technology, Gothenburg. https://research.chalmers.se/publication/516812.

Smith, G., 2021. Mobility as a service and public transport. In: Mulley, C., Nelson, J.D., Ison, S. (Eds.), The Routledge Handbook of Public Transport. Routledge, Oxon, pp. 33–45.

Smith, G., Sarasini, S., Karlsson, I.C.M., Mukhtar-Landgren, D., Sochor, J., 2019. Governing mobility as a service: Insights from sweden and finland. In: Finger, M., Audouin, M. (Eds.), The governance of smart transportation systems: Towards new organizational structures for the development of integrated, electric, automated and shared mobility. Springer International Publishing, pp. 169–188. https://doi.org/10.1007/978-3-319-96526-0_9.

Sochor, J., 2021. Piecing together the puzzle: mobility as a service from the user and service design perspectives, *International Transport Forum Discussion Papers*, 2021/08. OECD Publishing, Paris https://www.itf-oecd.org/piecing-together-puzzle-mobility-service-user-and-service-design-perspectives.

Sochor, J., Arby, H., Karlsson, I.C.M., Sarasini, S., 2018. A topological approach to mobility as a service: A proposed tool for understanding requirements and effects, and for aiding the integration of societal goals. Res. Transport. Bus. Manage. 27, 3–14. https://doi.org/10.1016/j.rtbm.2018.12.003.

Sochor, J., Karlsson, I.C.M., Strömberg, H., 2016. Trying out mobility as a service: experiences from a field trial and implications for understanding demand. Transport. Res. Record: J. Transport. Res. Board 2542, 57–64. https://doi.org/10.3141/2542-07.

Sochor, J., Sarasini, S., 2017. More than the sum of its parts? The Finnish public's perspectives on Mobility-as-a-Service and ITS. Presented at the 12th European Congress on Intelligent Transportation Systems.

Sochor, J., Strömberg, H., Karlsson, M., 2014. Travelers' motives for adopting a new, innovative travel service: insights from the UbiGo field operational test in Gothenburg, Sweden. Presented at the 21st World Congress on Intelligent Transport Systems.

Smith, G., Hensher, D. A., Ho, C., & Balbontin, C. (2022). Mobility-as-a-Service users: Insights form a trial in Sydney (forthcoming).

Sochor, J., Strömberg, H., & Karlsson, I. C. M. (2015a). The Added Value of a New, Innovative Travel Service: Insights from the UbiGo Field Operational Test in Gothenburg, Sweden. In: Giaffreda R., Cagáňová D., Li Y., Riggio R., Voisard A. (Eds.) *IoT Infrastructures* (169-175). Cham: Springer. https://research.chalmers.se/publication/204389.

Sochor, J., Strömberg, H., Karlsson, I.C.M., 2015b. Implementing mobility as a service: challenges in integrating user, commercial, and societal perspectives. Transport. Res. Record: J. Transport. Res. Board 2536 (1), 1–9. https://doi.org/10.3141/2536-01.

Steg, L., Vlek, C., 2009. Encouraging pro-environmental behaviour: An integrative review and research agenda. J. Environ. Psychol. 29 (3), 309–317. https://doi.org/10.1016/j.jenvp.2008.10.004.

Storme, T., De Vos, J., De Paepe, L., Witlox, F., 2020. Limitations to the car-substitution effect of MaaS. Findings from a Belgian pilot study. Transport. Res. Part A: Policy and Practice 131, 196–205. https://doi.org/10.1016/j.tra.2019.09.032.

Strömberg, H., 2015. Creating space for action-supporting behaviour change by making sustainable transport opportunities available in the world and in the mind. (Doctoral thesis), Chalmers University of Technology, Gothenburg. https://research.chalmers.se/publication/222635.

Strömberg, H., Karlsson, I.M., Sochor, J., 2018. Inviting travelers to the smorgasbord of sustainable urban transport: evidence from a MaaS field trial. Transportation 45 (6), 1655–1670. https://doi.org/10.1007/s11116-018-9946-8.

Strömberg, H., Rexfelt, O., Karlsson, I.C.M., Sochor, J., 2016. Trying on change–trialability as a change moderator for sustainable travel behaviour. Travel Behav. Soc. 4, 60–68. https://doi.org/10.1016/j.tbs.2016.01.002.

Tsouros, I., Tsirimpa, A., Pagoni, I., Polydoropoulou, A., 2021. MaaS users: Who they are and how much they are willing-to-pay. Transport. Res. Part A: Policy and Practice 148, 470–480. https://doi.org/10.1016/j.tra.2021.04.016.

Utriainen, R., Pöllänen, M., 2018. Review on mobility as a service in scientific publications. Res. Transport. Bus. Manage. 27, 15–23. https://doi.org/10.1016/j.rtbm.2018.10.005.

Vij, A., Ryan, S., Sampson, S., Harris, S., 2020. Consumer preferences for Mobility-as-a-Service (MaaS) in Australia. Transport. Res. Part C: Emerg. Technol. 117, 102699 https://doi.org/10.1016/j.trc.2020.102699.

Wittstock, R., Teuteberg, F., 2019. Sustainability impacts of mobility as a service: A scoping study for technology assessment. In: Teuteberg, F., Hempel, M., Schebek, L. (Eds.), Progress in life cycle assessment 2018. Springer International Publishing, Cham, pp. 61–74. https://doi.org/10.1007/978-3-030-12266-9_5.

Zijlstra, T., Durand, A., Hoogendoorn-Lanser, S., Harms, L., 2020. Early adopters of Mobility-as-a-Service in the Netherlands. Transp. Policy 97, 197–209. https://doi.org/10.1016/j.tranpol.2020.07.019.

Svensk Mäklarstatistik. (2019). Göteborg. Retrieved from https://www.maklarstatistik.se/omrade/riket/vastra-gotalands-lan/goteborg/-/bostadsratter/pris-tkr (2019-07-16).