

# Making urban mobility more efficient with Mobility-as-a-Service and Mobility Service Companies

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*Mobility-as-a-Service (MaaS) aims to integrate various forms of urban transportation into a single mobility service accessible on demand, which is possible due to the digitalisation of urban mobility. We explain how the concepts of MaaS and Mobility Service Companies (MOSCO) can overcome households' car-centered and inefficient mobility planning and may contribute to a more sustainable urban mobility system.*

## Are our current household mobility plans efficient?

Important societal transformations have happened over the last decades and will continue to be pursued in the future. Households evolved from a relatively standard four members to a set of diversified structures (e.g., single-parenting) with strong implications in the interpersonal relationships and daily organisation. With the increasing complexity of daily activities, personal mobility is progressively more complicated, where regular daily commuting is no longer the standard “home-work-home” trips. In turn, individual and household mobility plans vary from day to day, over weeks, seasons, and years.

Moreover, urban mobility systems have shifted dramatically from the dichotomous options of private car versus conventional public transportation (bus, underground, train, and taxi) to an intricate set of alternatives (public transportation plus vehicle sharing or pooling, minibus, transport-on-demand, short-term car rental), and their intermodal combinations, which increase the range of possibilities for the daily set of interconnected trips. The great revolution that urban mobility has undoubtedly suffered over the last decades thrives from the technological development and innovation, in particular of information and communication technologies (ICT) and the corresponding digitisation of the transport system, and the electrification of vehicles.

Information on urban mobility alternatives has also become ubiquitous, principally with the Internet of things and its mobile forms (e.g., smartphones). For short-term mobility decisions (e.g., going to a restaurant), resources such as route planners (e.g., Google Maps) are standard now and are commonly used, especially by younger generations. Conversely, it is not always straightforward to make adequate choices for longer-term household mobility planning that includes structural decisions such as house/work/school locations, private car acquisition, or choosing a public transportation monthly card, despite myriad in-

formation sources. In the face of this complexity, the final decision is too often buying one or several private cars and resorting to mobility ownership, instead of using services of mobility. Inter alia, the dominating modal share of cars, is responsible for much of the unsustainable urban evolution (e.g., air pollution, noise, urban space deprivation, inequity of access to opportunities, accidents, run-overs, time losses, and climate change).

We hypothesise that many households manage their mobility inefficiently, collectively contributing to that unsustainable path of current urban mobility systems. We argue that families should be more rational when planning their mobility and compare their current mobility options with more efficient alternatives that are growing in number and diversity. However, they often do not do it.

The reasons for not opting for more efficient mobility alternatives can be grouped into five broad categories:

1. Lack of awareness or knowledge to make the full cost accounts and compare mobility options (e.g., “I did not include depreciation of car in total car ownership expenses”);
2. Lack of information regarding the existing transport alternatives (e.g., “I wasn’t aware of car-sharing systems, costs, and potentialities”);
3. Social ties that interfere with mobility plan of the household (e.g., “I have to take my kids to school before work”);
4. Personal constraints or resource limitations (e.g., “I work until late hours, and there aren’t good public transportation options at that time”); and
5. Other benefits for the household (or household members) compensate for the lack of efficiency identified strictly from a transportation perspective (e.g., “I love to drive my car”).

Solving for the first four potential sources of inefficiency can be achieved through the mediation of households

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and the complex urban mobility system, where the bundling of urban mobility services into one contract could make the overall mobility endeavors of users more seamless. Such mediation services already exist in the energy sector with the energy service companies (ESCOs) (Vine, 2005) or telecommunication sector. This paper aims to explain how MaaS providers already offer packages of urban mobility services (e.g., Whim; <https://whimapp.com/>), while a new concept of mobility service companies (MOSCO) is put forward to mediate the household mobility planning and decision making.

**What is MaaS and what is left to do?**

Mobility-as-a-service (MaaS) was a natural evolution in the mobility sector from the everything-as-a-service (XaaS) thinking (Rimal and Choi, 2009). Among many available in the literature (Expósito-Izquierdo et al., 2017; Giesecke et al., 2016; Goodall et al., 2017; Jittrapirom et al., 2017; Karlsson et al., 2016), just to mention a few, one of the first definitions of MaaS was proposed by Sampo Hietanen (Hietanen, 2014), the current CEO of MaaS Global (<https://maas.global>):

“Mobility as a Service (MaaS) is a mobility distribution model in which a customer’s major transportation needs are met over one interface and are offered by a service provider. Typically, services are bundled into a package – similar to mobile phone price-plan packages.”

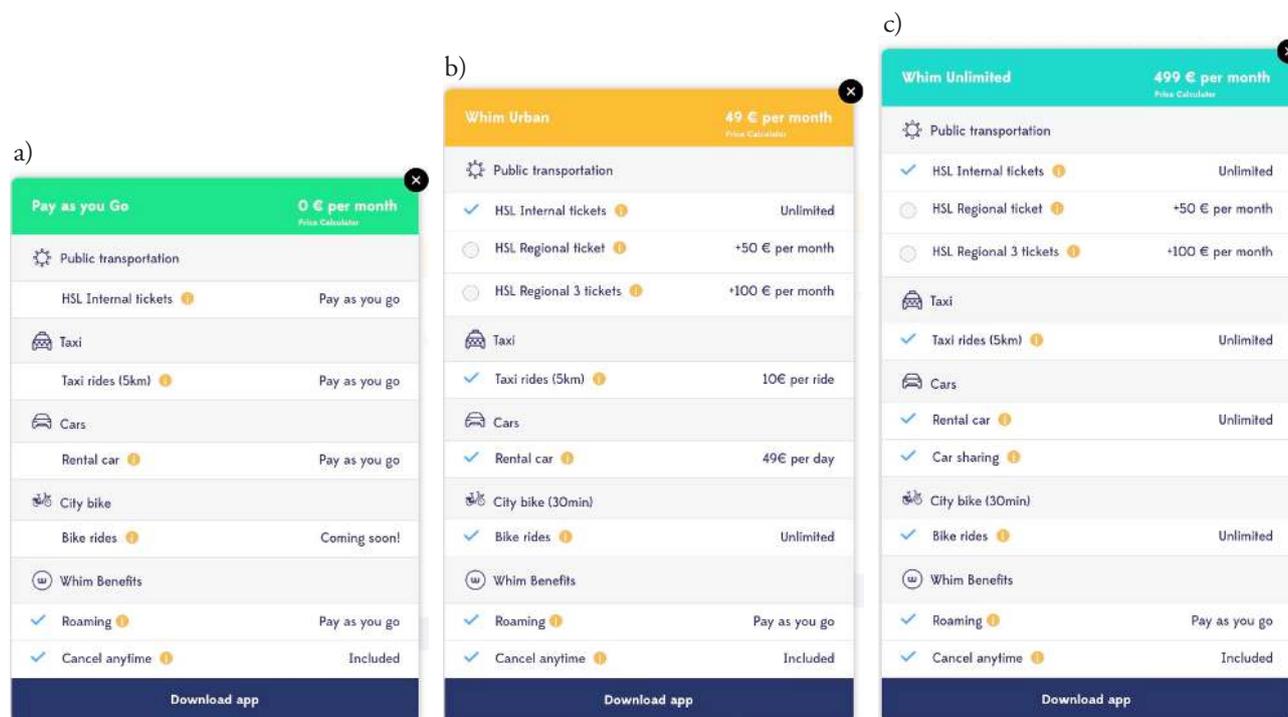
A more complete definition is proposed by the MaaS Alliance: “MaaS is the integration of various forms of transport services into a single mobility service accessible on demand. To meet a customer’s request, a MaaS operator facilitates a diverse menu of transport options, be they public transport, ride-, car- or bike-sharing, taxi or car rental/lease, or a combination thereof. \*”

While Hietanen (2014) highlights the digitised approach of MaaS where mobility users are met through an interface, the MaaS Alliance (2018) brings relevant specifications to the concept:

1. Integration of various forms of transportation into a single mobility service;
2. The service is accessible on demand; and
3. The service facilitates a diverse menu of transport options.

Other authors bring valuable clarifications to the concept. Leviäkangas (2016) specifies that transport providers can be either public or private, and König et al. (2017) refer to that MaaS is paid via a single account (or digital wallet).

Whim (<https://whimapp.com/>) is the first MaaS provider deployed in the market (Figure 1), operating currently in Helsinki (Finland), Antwerp (Belgium) and West Midlands (UK). Other options are being developed in the EU, such as the UbiGo project in Sweden (<http://ubigo.se>).



**Figure 1.** Whim MaaS packages in Helsinki: a) “Pays as you go”; b) “Urban”; c) “Unlimited”

Source: <https://whimapp.com/>

\*<https://maas-alliance.eu/>, last accessed November 2018

Although variable, total car ownership costs per kilometer average 0,30€ (refer to total car ownership cost calculators available on the Internet – e.g., <http://www.ev-app.eu/TCO-results.php>). For an annual mileage of 15.000 km, the monthly costs round up to 300€ to 500€ per month. Household car ownership in western countries averages 1 to 2 vehicles per family, meaning that an important part of these families dedicates 300€ to 500€ of their budget to the 2nd car, which might not be obligatory. Instead, the willingness-to-pay for the 100% availability of an often-oversized car (i.e., cars stopped and idling more than 95% of their lifetime; 80% of 5-seat unused capacity), could be allocated to MaaS packages and possibly save money. For example, the “Whim Unlimited” (Figure 1) offers unlimited trips in urban public transportation, taxi rides (up to 5 km), car rental and car sharing, and bike sharing. Ultimately, households could allocate the 600€ to 1000€ of car costs and shift away from car ownership to MaaS only and possibly save money.

MaaS providers are still taking off. Sochor et al., (2017) proposed a 5-level topology of MaaS services:

- Level 0 – No integration of transport services, where operators provide mobility services separately, as we knew it until a few years ago.
- Level 1 – Integration of information of multimodal travel plan and information of the tariffs for separate legs of the multimodal trip, which was made possible with the digitisation of transport activity and widespread smartphones.
- Level 2 – Integration of multimodal information, booking, and payment through e-wallets, but services are still not bundled together, and payments are made directly to each operator;
- Level 3 – Bundling of transport services into a single contract (but with different possible packages) integrated by a MaaS (this is the case of Whim or UbiGo); and
- Level 4 – Integration of societal goals, whereas policy makers can use MaaS services to implement car restriction policies to provide a more accessible and livable city.

Level 2 focuses on single-trip requirements, provides easier access to mobility services, and is a natural extension of route planners. Level 3 is a full alternative to car ownership and, as noted by Sochor et al., (2017), it “focuses on the total need of a household – it is about getting from morning to evening, Monday to Sunday, and spring to winter, rather than single trips from A to B.” Level 4 is the last step to full integration of MaaS into transport and mobili-

ty policy making, serving as a tool to provide good quality alternatives to current car-centered mobility organization.

MaaS can make daily mobility of individuals more seamless, in a way that trip-specific requirements are met (for example, traveling from one origin to one destination at a specific hour of the day, and not using bike-sharing systems), and the only choice users would need to make is how many minutes in advance they would need to order each ride. However, some problems remain unsolved.

Although quite straightforward for individuals, the MaaS concept assumes that households can fully calculate their total costs of mobility, which is not true, particularly when complex mobility relationships of dependents are involved. This type of analysis requires more complex approaches when structural decisions other than mobility are involved, for instance, those related to the location of work, home, and schools.

Furthermore, the outcome concerning urban mobility sustainability will always depend on the decisions of the user, in the face of options provided in each MaaS package. Ultimately, the user can opt for a car always if the package is designed in that way. As such, by itself, the MaaS concept does not guarantee a collective improvement of urban mobility sustainability, unless it is regulated to limit the low-occupancy usage of cars or to better match more adequate modes to the different trip lengths.

### **What could be the role of a MOSCO?**

The concept of a MOSCO was first proposed by Moura et al., (2016). To describe this concept, I use the analogy of medicine. MOSCO is a “doctor of mobility” who makes a diagnosis of the current household’s weekly mobility management; identifies potential problem and proposes a “therapy” to correct less-efficient mobility with options and possibilities.

To address the issue of household activity and mobility patterns, a diversified set of variables is collected simultaneously through detailed face-to-face interviews (where mobility survey apps in smartphones are the natural follow-up of this methodology, e.g., based on Google Maps’ timeline feature). The interview characterizes the household’s typical weekly activity and mobility plans while incorporating social network analysis to identify dependencies among alters (for example, grandparents who pick up kids at school), as proposed by Pritchard et al. (2016).

The interviewer initially begins with questions regarding the a priori knowledge and information that households have about their monthly mobility costs and possible al-

ternatives to their current organisation. For example, one fundamental issue is to ask the total monthly costs of car ownership that can be determined, and to consider other mobility options, as seen previously. Then, the interviewer collects information about the weekly set of activities and mobility decisions of all household members, determines their regular mobility requirements and the network of subordinations, namely with elicited alters, notably those considered “very close”. Current mobility key performance indicators (e.g., weekly travel costs, travel times, CO2 emissions) are then calculated and compared with those potentially obtained after presenting alternative mobility plans that resort to more efficient mobility solutions.

Although with a smaller sample of five households (namely, single-person household and four families with several dimensions, all having different mobility options), Moura et al. (2016) tested the approach for a proof-of-concept exercise, and results suggest that different types of households could all potentially and significantly reduce their annual mobility budgets (from 45% up to nearly 90%) and the corresponding environmental footprint (up to 30%).

These results sustained the assumption that households plan inefficiently their mobility agendas, as none knew the total costs of their car ownership and had an obsolete or inadequate knowledge of alternative mobility options, in particular such as the more recent shared-mobility solutions like bike-sharing systems that can solve the “first and last mile problem” of public transportation connections (Shaheen and Chan, 2016).

## Conclusions

The ultimate and futuristic scenario of all private cars being replaced by public transportation, taxis, and shared or pooled vehicles is now closer. Many mobility options have rolled out in many cities worldwide. Urban mobility has suffered a revolution with the technological development of ICTs and electrification of vehicles. However, many inefficiencies have yet to be overcome. For instance, households are not always aware of or do not know how to take full account of their mobility options. When the complexity of mobility organization increases (typically, when children are involved), resorting to a private car is an option with long-lasting effects, both on an individual basis and collectively speaking. MOSCO could help households in the task of making the right budgeting comparisons of competing for mobility plans, while MaaS is becoming a comprehensive and most competitive urban mobility solution to drive families away from cars.

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