Ministry of Infrastructure
and Water Management

EXPLORING MOBILITY-AS-A-SERVICE

EXPLORING MOBILITY-AS-A-SERVICE: INSIGHTS FROM LITERATURE AND FOCUS GROUP MEETINGS

Netherlands Institute for Transport Policy Analysis (KiM)

CONTENTS

This brochure summarises the main findings from a literature study (Durand et al., 2018) and focus group meetings (Harms et al., 2018).

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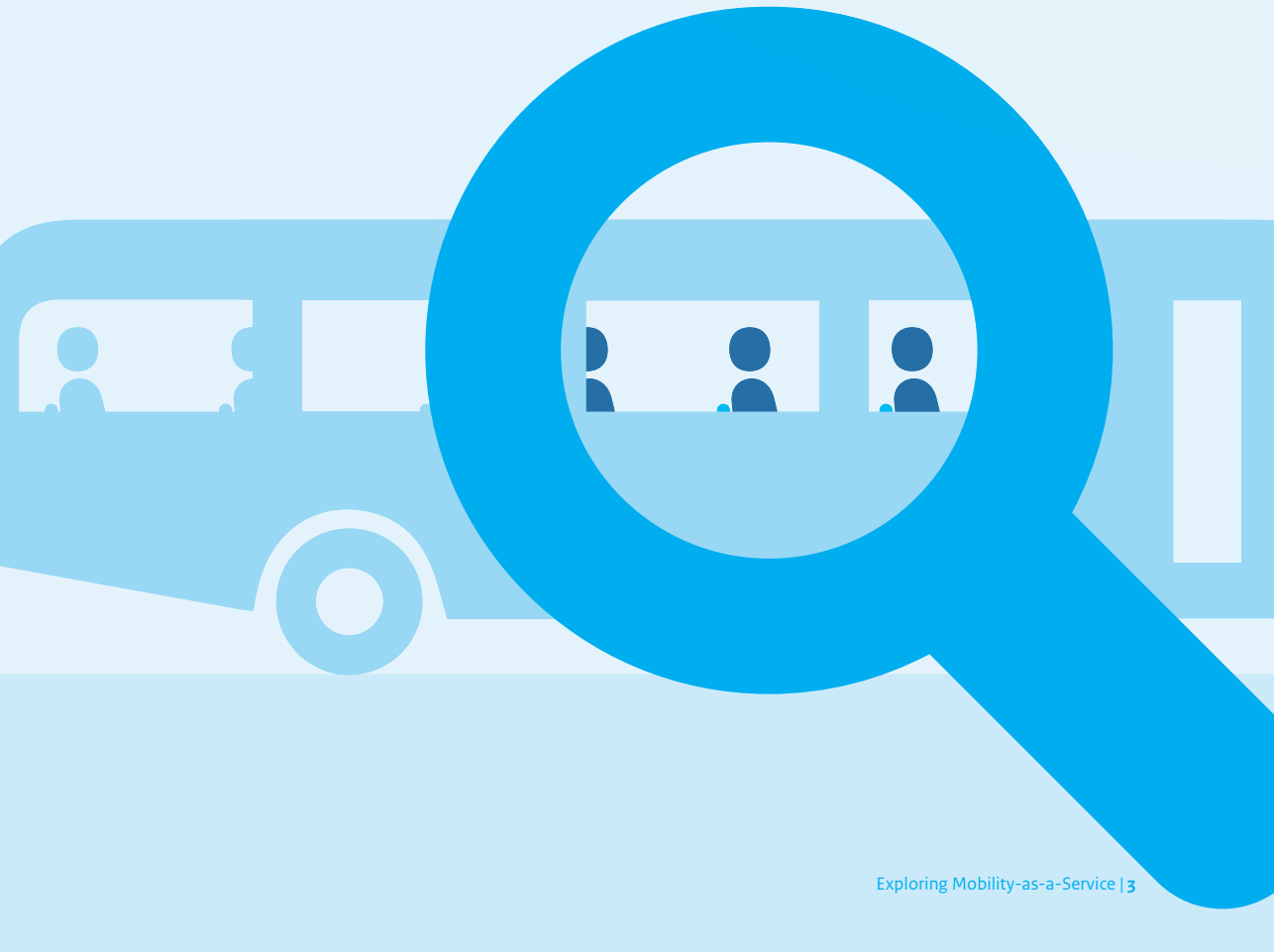
Better perception of the behavioural effects of Mobility-as-a-Service



Mobility-as-a-Service (in short: MaaS) fosters high expectations. This service could contribute to improving the living environment and the accessibility of cities and rural areas, in view of trends such as increasing urbanisation and the pressure on accessibility and liveability that this is causing. The depopulation of rural areas, and cutbacks in public transport services are also relevant here (MuConsult 2017).

Thus, MaaS raises expectations in terms of policy, yet at the same time raises many questions. A key question is, for example, to what extent are Dutch citizens prepared to accept and actually start using MaaS as a new form of service provision? How, ideally, should MaaS be designed in order to be adopted by the users? To what extent do the acceptance and the potential use of MaaS differ among the population?

The Netherlands Institute for Transport Policy Analysis (KiM) has launched a comprehensive research programme to answer such questions. This programme is not just based on existing knowledge; KiM also collects new insights in various ways, including surveys among the Dutch population. In the first exploratory phase of the programme, two sources have been used: (1) national and international literature, and (2) focus group meetings.

During the literature study, we looked through scientific journals and reports to collect existing insights regarding MaaS and related topics, such as shared mobility modes (e.g., car sharing and bicycle sharing) and the use of travel information systems. For an extensive explanation of the approach and findings of the literature study, including an exhaustive list of relevant references, see Durand et al. (2018).

In the focus group meetings, we collected information to map out the thresholds for and driving forces behind the acceptance and use of MaaS for various population segments. In order to accommodate the differences between residential locations of Dutch citizens and the associated ranges of transport systems, we have conducted three focus group meetings: one involving residents from the Amsterdam metropolitan area, one involving residents from the medium-sized town of Zwolle, and one involving residents of the rural areas surrounding Zwolle. The participants were distinguished by personal characteristics such as gender, age, household composition, and current mobility behaviour (whether they own a car, use public transport, et cetera). For a comprehensive report on the approach and the findings, see Harms et al. (2018).

In this brochure, we summarise the main findings from the literature study and the focus group meetings. Section 2 addresses the definition of MaaS in the existing literature. This section also lists the MaaS initiatives that have already been launched and their effects. Subsequently, we summarise the main findings from the literature study and the focus group meetings into (expected) impacts on travel preferences and travel behaviour.

Successively, we focus on the role of MaaS in relation to the use of individual means of transport (Section 3), the preconditions people set for MaaS use (Section 4), the perceived added values of MaaS (Section 5), and the personal characteristics that appear to affect the question of whether or not a traveller is open to MaaS (Section 6). The final section (Section 7) presents several conclusions and a prelude to the next steps.

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The world of MaaS: what does it involve and where is it operational?

Definition of MaaS: integration level 2 as a minimum level

What actually is MaaS? Recent years have witnessed the launch of a wide variety of initiatives in the mobility field under the heading of "MaaS", all differing in set-up. This diversity complicates the formulation of a sound definition of what MaaS is, what the service involves and what it does not. One of the first descriptions of MaaS was given by Hietanen (2014): "A range of mobility solutions in which a customer's main transportation requirements are met through a single interface and supplied by a single service provider".

MaaS is multi-modal and demand-driven

The Dutch Ministry of Infrastructure and Water Management defines MaaS as a range of multi-modal, demand-responsive mobility services, offering tailor-made travel options to customers through a digital platform providing real-time information. Payment and transaction processing are included. According to the Ministry, MaaS is intended to enable providers of mobility services to cope more efficiently with the diverging needs of travellers who are ever more demanding and have a wide variety of wishes. "This will enable the development of a more responsive, more efficient, and more resilient transport system for travellers," according to an exploratory report drawn up earlier under the authority of the Ministry (MuConsult 2017).

MaaS as an integrator

The attempts at defining MaaS as documented in (scientific) literature often use "integration" as a stepping stone. Cases in point include the provision of travel information integrated into the booking and payment of a trip, and the integration of the range of transport services and modes of transport into bundles (also called mobility packages). Sochor et al. (2017) have developed a typology distinguishing four integration levels, plus a basic level without integration (see Figure 1):

- **Level 0 = no integration.**
  This basic level refers to the situation in which separate services are provided for different means of transport.
- **Level 1 = integration of information.**
  At this level, travel information is provided through (multi-modal) travel planners, which may or may not include information on routes and costs. The added value level 1 holds for users is that it facilitates the choice regarding the time of day, the route, or the mode of transport to be used.
- **Level 2 = integration of finding, booking, and payment.**
  At this level, MaaS facilitates the finding, booking, and payment of individual trips. The added value of level 2 is that users can find, book, and pay for their trip at a single service point (e.g., through an app with a pre-registered credit card).
- **Level 3 = integration of transport services into passes and bundles.**
  At this level, MaaS does not just cover individual travel movements; the service also meets the full daily mobility needs of individuals and families by offering different means of transport through bundles and/or passes. The added value of level 3 is that MaaS now

offers users an alternative covering all their daily mobility requirements. Thus, it also constitutes an alternative for individual car ownership (according to Sochor et al., 2017).

- **Level 4 = integration of societal goals.**
  At this level, MaaS extends beyond liaising between the demand for and supply of mobility. Supply and demand are now combined with goals such as reducing the use of cars or promoting liveability in the cities.

In any case, the integration level is a useful reference in comparing MaaS initiatives, considering the fact that increasingly more new initiatives claim to offer MaaS, whereas they actually only provide travel information (level 1). The Netherlands Institute for Transport Policy Analysis proposes that level 2 be adopted as the lower limit in terms of MaaS. This means that we will confine the definition of MaaS to initiatives integrating, as a minimum, the finding, booking, and payment of trips. Although most MaaS providers ultimately pursue level 3 or 4, many of them currently stop at level 2.

Figure 1 Typology of Mobility-as-a-Service with levels (left) and examples (right) (derived from Sochor et al. 2017).

4	**Integration of societal goals** Policies, incentives, et cetera	
3	**Integration of services offered** Bundling/passes, contracts, et cetera	UbiGo whim GVH Hannovermobil smi)e simply mobile
2	**Integration of booking and payment** Single trip – find, book, and pay	moovit Qixxit Google TRANSPORT FOR LONDON lyft
1	**Integration of information** Multi-modal travel planner, price information	
0	**No integration**	Hertz sunfleet

Examples of MaaS

Integration up to the second level: Smile in Austria

The Austrian pilot project Smile is a high-profile MaaS provider operating at integration level 2. This pilot ran from 2014 until 2015 and involved collaboration between (major) transport providers and parties such as software engineers and environmental protection organisations. The Smile app offered multi-modal route information (enabling users to combine private vehicles, public transport, and shared mobility services within a single journey). Payment and ticketing were integrated. The follow-up to Smile, WienMobil, has been operational since 2017. This service features an improved travel planner (Beam-Beta).

Integration up to the third level: Shift, UbiGo, and Whim

As yet, only three MaaS initiatives have been designed to operate at integration level 3. The first of these is SHIFT, which has been developed in Las Vegas (United States) and has not been rolled out. SHIFT aims to integrate several different transport services, such as bicycle sharing, car sharing, taxis, and a valet service. The second initiative, UbiGo, is Swedish. This pilot project ran from 2013 to 2014. This service enabled families living in Gothenburg to buy prepaid bundles geared to their individual mobility requirements. The project is scheduled to be re-launched in Stockholm. The third initiative is Whim in Finland, which has been operational since 2016. Whim users can currently choose between two types of bundles. The Whim Urban "pay-as-you-go" bundle offers unlimited urban transport and reduced taxi fares for a monthly fee of 49 euros. The Whim Unlimited bundle, at 499 euros a month, is presented as a *"modern alternative for owning a car. For the price of car ownership, you will have unlimited access to public transport, taxis, or [shared-use] cars based on your daily needs." (MaaS Global, 2018)*.

Table 1 lists examples of MaaS initiatives across the globe, stating their integration level. The list is non-exhaustive, and many new initiatives are being developed, especially in Asia and Oceania.

Table 1 Examples of MaaS initiatives by level of integration

Name	Location	Status	Modes of transport*	Integration level
moovel	Hamburg and Stuttgart, Germany	Operational (2015-)	Car sharing, taxi, urban PT, regional PT	Level 2 (partially, payment integrated)
myCicero	Italy	Operational (2015-)	Urban PT, regional PT, international PT, parking, access to urban congestion charging zones	Level 2 (partially, payment integrated)
NaviGoGo	Dundee and North East Fife regions, Scotland, UK	Operational (2017-)	Car sharing, taxi, urban PT, regional PT	Level 2 (partially, payment integrated)
iDPASS	France	Operational (2017-)	Car rental, taxi, valet parking	Level 2 (partially, payment integrated)
Tuup	Turku region, Finland	Operational (2016-)	Car sharing, bicycle sharing, taxi, urban PT, DRT	Level 2 (partially, payment integrated), ticketing integration under development
Hannovermobil	Hannover, Germany	Operational (2014-)	Car sharing, taxi, urban PT, regional PT	Level 2
EMMA (TaM)	Montpellier, France	Operational (2014-)	Bicycle sharing, car sharing, urban PT, parking	Level 2
Business passes: NS Business Card, MobilityMixx, Radiuz Total Mobility, et cetera	Netherlands	Operational (national coverage with effect from 2013)	(Car sharing, parking, fuel costs, e-car charging, taxi, car rental), bicycle sharing, urban PT, regional PT	Level 2 (Business to Business), partially level 1
Smile	Vienna, Austria	Pilot (2014-2015)	Bicycle sharing, car sharing, taxi, urban PT, regional PT, parking	Level 2
WienMobil Lab	Vienna, Austria	Operational (2017-)	Bicycle sharing, car sharing, taxi, urban PT, parking	Level 2
SHIFT	Las Vegas, US	Planned (2013-2015)	Bicycle sharing, car sharing, taxi, DRT, valet parking	Level 3
UbiGo	Gothenburg, Sweden	Pilot (2013-2014), version 2.0 in preparation	Bicycle sharing, car sharing, car rental, taxi, urban PT	Level 3
Whim	Helsinki, Finland	Operational (2016-)	Bicycle sharing (car sharing u.d.**), car rental, taxi, urban PT, regional PT	Level 3

*PT = public transport **u.d. = under development

MaaS and new forms of mobility

MaaS does not just involve the integration of mobility. In many cases, MaaS entails the introduction of new forms of transportation, such as bicycle sharing and car sharing, or innovative forms of demand-responsive transport, supplementary to the existing range of public transport systems.

Bicycle sharing and car sharing

A common component of MaaS (which is not a precondition for such a service) is shared mobility. Examples are shared-use bicycles or cars as an alternative to private ownership of a bicycle and/or car. Bicycle sharing systems enable users to borrow a bicycle for a short period of time, for a small fee. Such systems are mainly used for transportation to and from standard locations, such as a train station. Recent years have seen an influx of so-called "free-floating" (or "one-way") bicycle sharing systems, enabling users to pick up and return bicycles at any location of their choice. Examples of such bicycle sharing systems are the public transport bicycles in the Netherlands, Citi Bikes in New York, Santander Cycles in London, and "free-floating" share systems such as FlickBike, Gobike, oBike and Mobike.

Car sharing works in a similar way. Subscribers to a car sharing system may borrow a car for a period ranging from several minutes to several days. Similar to bicycle sharing, some car sharing systems require users to return the car to a standard location (usually a car park at a particular location). "Free-floating" systems allow one-way travel (to any destination within a region). Examples of car sharing systems are Greenwheels in the Netherlands, car2go (available in 26 cities around the world), Zipcar (in several countries, including the United States and Canada), GoGet (Australia), and Cambio CarSharing (Germany and Belgium).

Collective and individual demand-responsive transport

Increasingly more often, MaaS also includes demand-responsive forms of transport. In this respect, a distinction can be made between collective and individual demand-responsive transport systems. Collective demand-responsive transport services (frequently referred to as simply "demand-responsive transport" or "DRT") involve door-to-door or stop-to-stop transportation (often by minibus). In fact, this can be seen as a form of flexible public transport, or in other words: public transport services that do not operate on the basis of a fixed timetable. Examples of DRT systems in the Netherlands are Opstapper and Brengflex. ViaVan in Amsterdam is fully commercial, as are Lyft Line in the United States, Citymapper Smart Ride in London, and UberPOOL in several countries. Individual demand-responsive transport services, frequently described as "ride hailing" or "ride sourcing", are quite similar to traditional taxis. The difference is that supply and demand are linked using a smartphone (rather than someone hailing a taxi in the street by raising his or her arm). Examples of ride-sourcing services are Uber, Lyft and Didi Chuxing.

3

MaaS and the private car paradigm

A recurrent theme in scientific literature on MaaS is the role of privately owned cars: can MaaS offer an alternative to private car ownership and use? Multiple MaaS providers, among which the Finnish Whim programme, have adopted this idea as their point of departure: *"At Whim, we believe that owning a car doesn't make much sense anymore for most people. Whim is a more affordable alternative for car ownership without all the hassles. Every journey is covered – whether it's taxi, public transport, a car service or a bike share. Simply pay as you go or travel even smarter with a monthly plan."* (www.whimapp.com).

The use of MaaS versus a privately owned car

Several pilot studies have shown that MaaS may cause a decline in the use of privately owned cars. More than one-fifth of those participating in the Smile MaaS pilot in Vienna used their private cars less frequently during the pilot. With UbiGo in Sweden, car use has dropped even further: here, 44 per cent of the participants decreased their use of private cars. Furthermore, UbiGo has had a positive effect on the perception of alternatives to privately owned car.

In this respect, it is important to note that prior to the commencement of the pilot, potential UbiGo participants were encouraged to give up (one of) their car(s) during the process, in exchange for financial compensation. One-quarter of the families approached chose to accept the challenge and no one changed their mind during the six months of the pilot. It should be noted that the group that participated in the pilot was selective and certainly not representative of the entire population. Other MaaS pilots are selective as well, e.g., because participation is largely voluntary (which means that the pilot will, by definition, attract users who are interested in new transport concepts). This makes it difficult to draw any general conclusions, for example, in terms of the effects on car ownership and car use.

Ownership versus use

Another recurrent topic in scientific studies on MaaS involves the ownership and use of private cars versus the use of shared cars. For example, a study conducted in London has shown that two-thirds of non-car owners in London find owning a private car unnecessary, regardless of age or the neighbourhood they live in. One in three car owners in London indicate that they would like to have access to a car, without owning one themselves. In addition, one in three indicate that MaaS could help them become less dependent on their own car. However, attitudinal research does not perfectly reflect future behaviour. In this concrete example: it is doubtful whether residents of London (or other cities) will in fact start changing their mobility behaviour once MaaS services are actually offered. And to qualify this statement: the study has also shown that half of London car owners are (very) attached to their own cars and not prepared to replace them by a shared-use car (Kamargianni et al., 2018).

Furthermore, in practice, the decision to own or not own a private car frequently does not a involve a black-and-white choice. Intermediate forms are conceivable, in which use and ownership co-exist.

The experts interviewed in the study conducted by Smith et al. (2018) all believe that the adoption of MaaS can cause a decline in car ownership. More specifically, they believe that urban and suburban families will at first get rid of their secondary cars; only at a later stage will they bid farewell to their primary car as well.

The focus groups have also extensively explored the question as to the degree to which MaaS constitutes an alternative to privately owned cars. Many respondents believe that MaaS will only replace private car ownership and use to a limited extent; they rather regard the service as supplementary to their own cars. Only a few respondents believe that MaaS can offer an alternative to privately owned cars with respect to daily mobility as well.

> *"What do I need [MaaS] for? I already have a car on my driveway which has been paid for!"*
>
> Male, age 31, rural area near Zwolle

> *"I could consider getting rid of my own car, if it is that easy [with MaaS]. If it is worth my while, price-wise, I would get rid of my car."*
>
> Male, age 67, rural area near Zwolle

The role of public transport

According to some researchers, MaaS can change the current role and organisation of public transport systems. For example, Matyas and Kamargianni (2018) state that public transport should constitute the backbone for MaaS – that is, in large metropolitan areas such as London, Sydney, and Vienna. Residents of these cities appear to prefer mobility bundles featuring unlimited use of public transport. A survey conducted among London residents revealed that one-third of frequent car users would start travelling by public transport more often if MaaS were available (based on bundles providing access to public transport, bicycle sharing, car sharing, and taxis for a monthly fee of between 60 to 170 pounds). Such a shift, if it ever occurred, could cause major congestion in public transport in and around the stations (Kamargianni et al., 2018). On the other hand, 12 and 22 percent of regular public transport users, respectively, stated that they would opt for car sharing and taxis rather than public transport, if MaaS would make such options available. A proportion of the transport professionals interviewed by Smith et al. (2018) warned that easier access to, e.g., shared-use cars could potentially steer public transport users away from public transport systems. The profitability of car-based services for MaaS providers compared to public transport could even enhance this effect. Such a shift may reduce the positive environmental impact of MaaS (such as air quality, noise, et cetera) and add to car-related traffic congestion.

4

Preconditions for MaaS

Scientific literature on MaaS identifies several preconditions for success. The need for offering autonomy and flexibility recurs particularly frequently, as does the importance of reliability (and its changing interpretation). Other preconditions discussed in the focus group meetings included availability at various locations and times of day.

Autonomy and flexibility

The outcomes of a survey among UbiGo participants show *flexibility* and *autonomy* to be important preconditions for MaaS. In this context, flexibility involves the option of adapting travel behaviour if personal circumstances so dictate, regardless of the time of day and the location. Autonomy pertains to independence of others in taking decisions regarding mobility. The importance of these preconditions is demonstrated, e.g., by a study into the potential of MaaS with UbiGo as an example, in which travellers expressed the wish to have access to a (shared-use) car anytime and anywhere, "just in case". In another study, respondents emphasised the crucial importance of the flexibility and autonomy provided by privately owned cars, on account of the combined journeys they are required to undertake, whether on business (meetings at different locations) or for private purposes (picking up children from school, grocery shopping after work, and so on).

In the focus group meetings, respondents associated MaaS with a lack of autonomy and flexibility. They regarded the need for advance planning and *dependency on a system* as particularly important disadvantages of MaaS, especially when comparing this service to the convenience and availability of a private car:

> *"In my opinion, a disadvantage [of MaaS] is that you are no longer flexible if it is not yours. You really need to plan ahead to do something today or tomorrow. This curbs spontaneity."*
>
> Female, age 28, Zwolle

Reliability

Shared mobility modes (such as car sharing or ride sourcing) lead to new interpretations of reliability. For example, studies into MaaS that explicitly cover a range of shared mobility services show that people are ready to pay more for *last-minute availability*. Another study has established that people using collective demand-responsive transport services like to have *certainty regarding the pick-up time*. Furthermore, such certainty is deemed more important than, e.g., the time between booking and pick-up.

In the focus group meetings, respondents also underscore (last-minute) availability as an important precondition for MaaS:

> *"Occasionally, you want to leave right away, but you don't have a bicycle. At such times, where and when [can I pick up a shared-use bicycle]? Rather than spending less than half an hour on grocery shopping, I need*

to arrange for a bike and then go to the supermarket. In my opinion, this would take much longer. Too much hassle for short rides."

Female, age 55, Amstelveen

Another form of reliability reviewed in the focus group meetings involves the operation of *technology*, such as the working of an app, dependency on smartphones and their batteries, and the availability of Internet connections:

"Everything needs to be done via a smartphone. It becomes your lifeline, you don't have a back-up. Take the major Internet providers, what happens if something is wrong and you call customer support... So, I need to see it to believe it."

Male, age 45, Zwolle

A last form of reliability identified in the focus group meetings involves the warranty provided by MaaS in the event of calamities. What warranty is offered if something goes wrong? Are incidents covered by *insurance* or is *compensation* provided*?*

"Suppose I need to be in Amsterdam and someone is picking me up. I have a job interview somewhere in Amsterdam. Suppose he has a flat tyre and [he] cannot drive on, but I have an important meeting. Can I hold the [MaaS] company liable in such cases?"

Male, age 22, Zwolle

Availability in terms of location

In addition, the focus groups reviewed several other preconditions for MaaS. First of all, the geographic availability of the service at various locations. In this respect, many respondents indicate their expectation that the service would initially be offered mainly in the large cities and in the western part of the country.

"You are living in a village, then how does it work? Do you first need to get to a garage to pick up a car? Isn't that quite cumbersome?"

Female, age 51, rural area near Zwolle

Availability in terms of time

Availability in terms of time of day is also regarded as a precondition for success:

"The greatest flaw [of MaaS] is the availability of the service. Suppose there are 20 shared-use bicycles available, and there is a queue of 50 people, then you have a problem. In my perception, it is a given that 100% availability will not always be a reality."

Male, age 45, Zwolle

5

Added values of MaaS: the four Cs

To a significant extent, the interest in MaaS and the inclination to start using the service are dependent upon its added value. How does MaaS offer more than the current range of mobility (services)? Or, in other words, why should people want to change their mobility behaviour? The literature on MaaS and the focus groups have identified four aspects that could potentially offer added value: *costs*, *convenience*, *choice*, and *customisation*.

The first C: Costs

A potentially decisive reason for using MaaS is cost savings, for example, because MaaS may be cheaper than owning one's own car or holding an annual public transport pass. However, in actual practice, realising perceived cost savings will be difficult. Although car ownership entails considerable fixed costs, the variable costs (of driving additional kilometres) are relatively low. As a result, on balance, many perceive car ownership as cheaper than it actually is. Variable costs may, incidentally, be more manifest in cities where car ownership is much more expensive on account of toll charges and high parking fees, such as in London or Amsterdam.

The costs involved in the use of MaaS frequently came up in the focus group meetings. The initial reaction of respondents turns out to be highly dependent on the manner in which the costs are presented. An overview based on an existing concept, including monthly fees for packages ranging from 50 to 500 euros, raised a great deal of resistance:

> *"If I see a monthly fee of 500 euros, I am shocked. What kind of fee is that? Outrageous!"*
>
> Female, age 70, Amsterdam

> *"[It can only be an alternative] if the price is adjusted. It should be attractive, it is something that isn't yours, you share it with other people, then it should be a shared price. A competitive price."*
>
> Male, age 34, Amsterdam

The costs referred to in this example were not presented to all the focus group meetings. In the meetings in which no prices were mentioned, respondents regarded the potential cost savings of MaaS (vis-à-vis the current situation) as a particularly significant added value:

> *"The price must be reasonable; as a minimum, comparable to other modes of transport, but preferably cheaper."*
>
> Female, age 51, rural area near Zwolle

> *"... If you are just using this, [you do not need] possession and ownership [anymore], then you no longer have any insurance-related costs and no other recurrent expenses. You don't have any responsibility, not even if something breaks down."*
>
> Male, age 67, Zwolle

Second C: Convenience

Convenience constitutes a potentially significant added value for MaaS too. This is revealed, e.g., in an evaluation survey among UbiGo pilot participants. The highly comprehensive services provided have generated a feeling of "all-inclusiveness" among the participants. A feeling that has been enhanced by the confidence that any new problem will be addressed and resolved quickly (Sochor et al., 2015).

The focus groups also frequently identified convenience as an advantage of MaaS. More specifically, the respondents referred to the clarity of the system and the fact that MaaS can make life easier for travellers:

> *"Its main strength is that everything is clearly gathered into a single application, which you can also use to pay, so I assume you know in advance how much you will be charged."*
>
> Male, age 62, Amsterdam

> *"Convenience, you open the app, enter something and it comes rolling out. I don't need to puzzle how to get somewhere, I only need to type in [destination] and [travel time, transport options, and costs] are calculated automatically"*
>
> Female, age 48, Zwolle

Third C: Choice

Another important factor, in addition to costs and convenience, is offering freedom of choice. For example, UbiGo pilot participants appreciated the wide range of transport services offered via a single integrated platform. They also liked the diverse fleet of cars available to them. Freedom of choice does not just involve offering different modes of transport (e.g., a bus or an e-bicycle); it also pertains to the range of vehicles on offer (e.g., an electric city car or family car). According to MaaS researchers, a "virtual fleet" combining different vehicles and modes of transport may reduce the significance of privately owned cars.

Respondents in the focus group meetings also appreciated the *freedom of choice* potentially offered by MaaS. Furthermore, some claimed that insight into the alternatives could lower the threshold for using public transport systems:

> *"... A single overview shows all the options, which is easy. Those different bundles are quite amusing; they make public transport more get-at-able. If you have a prepaid bundle anyway, you tend to use it more."*
>
> Female, age 28, Zwolle

"Sometimes I choose a mode of transport beforehand and then you forget all the other options. Perhaps this will trigger you to use other options. Not just the volume but also the diversity in modes of transport."

Female, age 48, Zwolle

Fourth C: Customisation (tailoring to personal needs)

Literature on smartphone applications and mobility behaviour shows that the probability of behavioural changes increases if the services provided are geared to personal needs. This also emerges from studies into MaaS: according to those who examined the effects of the UbiGo pilot, the fact that bundles were tailored to the wishes of individual customers played a fundamental role in changing mobility behaviour. The UbiGo participants themselves stated that having a bundle made them review their existing travel habits: nearly two-thirds of the participants indicated that UbiGo encouraged them to make more use of alternative modes of transport, in particular car sharing, buses, and trams. Nearly everyone was satisfied with such changes. In this respect, however, it should be borne in mind that the UbiGo participants did not reflect the average population composition (cf. Section 3).

In relation to the customisation of MaaS services, researchers in London use the term of "collaborative customisation". This refers to the dialogue between customers and service providers, in which the first is capable of explaining his own needs so that the latter can use the information to create a tailor-made service or product (Kamargianni et al., 2015). Although many sectors refrain from using methods that provide an exact picture of customers' wishes, Kamargianni et al. (2015) claim that this need not be a problem in MaaS because it does not involve services of a physical nature. According to the researchers, three elements are required to design a package that is geared to specific needs: insight into the current individual mobility patterns of potential users, insight into the socio-economic status of potential users, and insight into their attitudes and perceptions in relation to mobility.

The need for tailored choices also came up in the focus group meetings. However, most respondents were doubtful as to the feasibility of such choices. In their view, MaaS could never meet individual requirements and demands:

"... If I want a bicycle, will they have one in my size? Riding an unfamiliar bike can be quite difficult. I just want my own things."

Female, age 55, Amstelveen

"My two boys both use child seats. How will they manage that?"

Male, age 31, rural area near Zwolle

6

Current mobility behaviour and personal characteristics

Another factor that has a bearing on the use of MaaS is current mobility behaviour, as is evident from the scientific literature studied and the focus group meetings conducted. For example, it makes quite a difference whether people already have experience using public transport or travel only by car. Furthermore, personal characteristics, such as household composition or residence location also turn out to affect people's inclination to use MaaS.

Current mobility behaviour

Many studies reveal a tendency for people to maintain existing behaviour rather than opting for new behaviour. This so-called "status quo bias" constitutes a socio-psychological threshold for behavioural change and thus for the adoption of MaaS. This implies that existing experience with using public transport, being accustomed to choosing between modes of transport prior to travelling or being accustomed to using multiple means of transport within a single journey (multi-modal mobility behaviour) will boost the probability of someone being open to a multi-modal range of transport options through MaaS.
A lack of experience with, e.g., public transport may, therefore, constitute an obstacle to the use of MaaS. Major differences in inclination to start using MaaS are, for that matter, mainly found between car owners and non-car owners. Studies have shown that car owners who use their car very frequently (four days a week or more) and do not or hardly ever travel by public transport are least inclined to opt for MaaS; hence, few, if any, changes can be expected in their mobility behaviour. The same shows up in the outcomes of the focus group meetings; here, MaaS raises particular doubts among car owners:

> *"I already have a car on my driveway which has been paid for!"*
> Male, age 31, rural area near Zwolle

Incidental and leisure travel

Furthermore, the focus group meetings reveal that MaaS has particular potential in terms of leisure travel and/or journeys to irregular, unknown destinations. For other, daily destinations (such as going to and from work or school), respondents actually do not pin much faith on MaaS:

> *"I would use it [in particular] for a day out or when going clubbing with friends."*
> Female, age 28, Zwolle

> *"Yes, especially for new things and holidays, city trips, it lets you get everywhere quickly and easily."*
> Female, age 56, Zwolle

> *"It's also about being familiar with the area. I would use it when going to unfamiliar places. It gives you more confidence."*
> Male, age 65, rural area near Zwolle

Digital skills

Whether someone will be using MaaS or not is also determined by his or her digital skills, for example, whether he or she is already using a smartphone and (travel) apps. After all, in almost all cases, MaaS is offered through a digital interface, often using apps that are compatible with smartphones or tablets. In this context, age also plays a crucial part in MaaS acceptance: young adults with a better command of digital skills are more inclined to start using MaaS than are older generations (cf. Kamargianni et al., 2018).

Socio-demographic characteristics

In addition to existing behaviour and digital skills, various personal characteristics play a part in the question of whether or not someone will be using MaaS. Education is an important factor: highly educated people appear to be more interested in this service (Alonso- González et al., 2017). Furthermore, age and household composition (in particular, the amount of children) appear to affect an inclination for MaaS: households with two or more young children show less interest in MaaS than do other households (Haahtela & Viitamo, 2017). This also emerges from the focus group meetings:

> *"...I have two little girls, alive and kicking at 2 p.m., but two hours later they are vomiting. Then can I cancel [the MaaS travel request]? Or suppose halfway through, someone [would like to come along], then what? How do I settle those costs? You owe me this much, you owe me that much, is that how it is done?"*
>
> Female, age 28, Zwolle

Another issue that emerges from the focus group meetings is that MaaS appears especially appropriate for residents of large cities, where owning and using private cars is not always convenient. Residents of rural areas have less confidence in a rapid adoption of MaaS.

Cultural characteristics

Other studies show that cultural aspects also play a part in people's interest in MaaS. Of particular relevance is the degree of "service orientation" of a culture (see, e.g., Haahtela & Viitamo, 2017). This is manifest in, for example, people's inclination to use car sharing, have groceries delivered at home, or frequently use the Internet to retrieve travel information and to book and pay for journeys. In this respect, a country such as Finland appears to be less developed than countries such as the Netherlands or Switzerland. This could partly explain why travellers in Finland are less inclined to use MaaS than are travellers in other countries.

7

Conclusions and next steps

Increasingly more locations all over the globe are experimenting with Mobility-as-a-Service (MaaS). However, the types of mobility services offered differ widely. In this brochure, the Netherlands Institute for Transport Policy Analysis provides an overview of MaaS initiatives and describes a framework for categorising such initiatives based on four integration levels: integration of information (level 1), integration of finding, booking, and payment (level 2), integration of transport services into passes and bundles (level 3), and integration of societal goals (level 4).

MaaS initiatives offer integration level 2 as a minimum

The above levels are a useful reference in comparing MaaS initiatives. The fact is that many new initiatives are launched under the heading of MaaS, yet in reality all they do is provide travel information (level 1). The Netherlands Institute for Transport Policy Analysis proposes that the definition of MaaS be confined to levels 2, 3, and 4. As a minimum, these initiatives integrate searching, booking, and payment. Although most MaaS providers ultimately pursue level 3 or 4, many of them currently stop at level 2.

Young adults in major cities as 'early adopters'

The insights gained from the literature study and the focus group meetings show that, in principle, MaaS can offer sufficient added value to ensure the commitment of certain groups of travellers. In this respect, it seems likely that, in particular, young adults living in large cities will be among the "early adopters" of MaaS. Initially, they will mainly be using the service for occasional trips.

MaaS factors for success

Nonetheless, for the time being it is highly uncertain whether MaaS will actually cause changes in travel behaviour in everyday practice, and to what extent the service will, for example, offer an alternative to the use of privately owned cars. Much appears to depend on the manner in which MaaS is substantiated, on the preconditions that are satisfied, and the added value vis-à-vis the current range of transport options. In any case, it is currently unlikely that in a few years' time MaaS will lead to significant shifts in daily mobility and to a decline in ownership and use of private cars.

- In order for MaaS to be successful, the service must, at any rate, offer *autonomy* and *flexibility*, be *reliable*, and ideally be *available* anytime and anywhere. Presumably, the latter is not a realistic point of departure in rural areas.
- MaaS must also provide *added value* vis-à-vis the current situation. Four added values (four Cs) appear particularly significant in this respect: Costs (offering cost benefits), Convenience, Choice, and Customisation.
- *Current mobility behaviour* may play a part in the question of whether or not travellers are open to MaaS. For example, it makes quite a difference whether people already have experience with public transport or whether they only travel by car. Furthermore, households without a car of their own appear to be more susceptible to MaaS than are households owning one or more cars. Finally, personal characteristics, such as household composition or residence location, appear to have a bearing on someone's inclination to opt for MaaS.

Need for additional research

Additional research is needed to gain a better view of how MaaS impacts travellers' preferences and behaviour. Within the framework of its research programme focused on MaaS, the Netherlands Institute for Transport Policy Analysis will draw up a qualitative estimate, based on existing and new data, of the potential that the service holds for various population groups. The results of this follow-up study are scheduled to be available by the first months of 2019. In addition, the Netherlands Institute for Transport Policy Analysis is involved in the monitoring and evaluation of the pilots that will be launched in various regions over the course of 2019.

References

- Alonso-González, M., Van Oort, N., Cats, O., & Hoogendoorn, S. (2017). *Urban Demand Responsive Transport in the Mobility as a Service ecosystem: its role and potential market share.* Paper presented at the International Conference Series on Competition and Ownership in Land Passenger Transport (Thredbo 15), Stockholm, Sweden.
- Durand, A., Harms, L., Hoogendoorn-Lanser, S., & Zijlstra, T. (2018). *Mobility-as-a-Service and changes in travel preferences and travel behaviour: a literature review.* The Hague: Netherlands Institute for Transport Policy Analysis (KiM).
- Haahtela, T., & Viitamo, E. (2017). *Searching for the potential of MaaS in commuting - comparison of survey and focus group methods and results.* Paper presented at the 1st International Conference on Mobility-as-a-Service, Tampere, Finland.
- Harms, L., Durand, A., Hoogendoorn-Lanser, S., & Zijlstra, T. (2018). *Focusgroepgesprekken over MaaS: een verslag.* The Hague: Netherlands Institute for Transport Policy Analysis (KiM).
- Hietanen, S. (2014). *'Mobility as a Service' - the new transport model? ITS & Transport Management Supplement. Eurotransport.*, 12(2), 2-4.
- Kamargianni, M., Matyas, M., Li, W., & Schäfer, A. (2015). *Feasibility Study for "Mobility as a Service" concept in London.* MaaSLab - UCL Energy Institute Report.
- Kamargianni, M., Matyas, M., & Li, W. (2018). *Londoners' attitudes towards car-ownership and Mobility-as-a-Service: Impact assessment and opportunities that lie ahead.* MaaSLab - UCL Energy Institute Report, Prepared for Transport for London.
- MaaS Global. (2018). *Whim Helsinki - Find your plan.* Retrieved from https://whimapp.com/monthly-plans/. Accessed on February 22nd, 2018.
- Matyas, M., & Kamargianni, M. (2018). *The potential of Mobility as a Service bundles as a mobility management tool.* Transportation, Published online on August 6th 2018. doi:10.1007/s11116-018-9913-4
- MuConsult. (2017). White Paper Mobility as a Service in the Netherlands.
- Smith, G., Sochor, J., & Karlsson, I. C. M. (2018). *Mobility as a Service: Development scenarios and implications for public transport.* Research in Transportation Economics. doi:10.1016/j.retrec.2018.04.001
- Sochor, J., Strömberg, H., & Karlsson, I. C. M. (2015). *Challenges in integrating user, commercial and societal perspectives in an innovative mobility service.* Transportation Research Record: Journal of the Transportation Research Board, 2536.
- Sochor, J., Arby, H., Karlsson, I. C. M., & Sarasini, S. (2017). *A topological approach to Mobility as a Service: A proposed tool for understanding requirements and effects, and for aiding the integration of social goals.* Paper presented at the 1st International Conference on Mobility-as-a-Service, Tampere, Finland.

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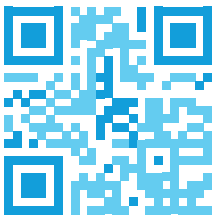

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