# BEYOND MaaS

# How to realize the promise of Mobility-as-a-Service

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Arthur D Little
Future of mobility lab

# Content

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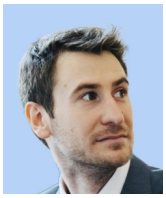

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# Setting the scene

### What mobility systems need to deliver

It has been said that diseases shape cities, from the development of urban sewers in the 19th century as a response to cholera outbreaks, to the COVID-19 pandemic today, which has acted as a watershed for city authorities to reflect and reset mobility visions and strategies. Similarly, sustainability is now becoming a truly central and urgent issue as the adverse impacts of human activity on the environment become ever clearer.

The mobility systems of the world's cities therefore need to adapt rapidly to become more environmentally sustainable, more resilient, and adaptable in the face of shocks and discontinuities. They should be centered on the needs of human beings rather than being determined primarily by their technological infrastructure. Becoming more sustainable, resilient, and human-centric should be a central ambition of every urban mobility system today.

### MaaS as part of the solution

Mobility-as-a-Service (MaaS) has potential to help cities reach this ambition. The vision of a technology-enabled future, in which citizens transition away from ownership and use of individual cars by default in favor of convenient, instant access to a rich range of tailored mobility services via an integrated service platform, has been around for nearly a decade. But while there have been some encouraging developments in the deployment of MaaS over the past few years, success is still limited and there remain significant barriers to widespread adoption and measurable impact.

Several more years and multiple further attempts at defining appropriate market models, enabling regulations, and value propositions will however be required to test and learn what are the required ingredients – and the order in which they need to be added to the mix – for the MaaS concept to be able to deliver on its promises. Successful design and deployment of MaaS should be considered as a journey requiring a comprehensive approach, including strategic, technical, regulatory, and change considerations.

### Shedding some light

In the last few years much has been written about MaaS. More recently, there has hardly been a single week without a specialized report, conference slot, or expert article on the topic. MaaS has become a buzzword used to trigger interest around mobility topics. However, much of the current discourse around MaaS is academic or conceptual and envisages ambitious futures built on fragile foundations. Other reports lack objectivity because their authors represent companies trying to carve out a role for themselves in MaaS ecosystems.

With this study, we aim to bring objectivity, new perspectives, and realism to the question of how to realize the MaaS promise. To that end we are building on our own experience as strategy consultants advising cities and public and private MaaS operators and vendors on the design and development of MaaS concepts and solutions, as well as entrepreneurs driving real MaaS deployments and witnessing both the successes and failures.

We begin with a review of what the MaaS concept really means, what it promises to deliver, and where we have got to today in its development and deployment. We go on to identify five key factors for success to overcome the barriers and achieve virtuous MaaS deployment.

Finally we identify six further requirements to move "beyond MaaS" toward the goal of sustainable, resilient, and human-centric mobility systems. Central to these requirements is the adoption of a unified and collaborative governance approach with, at its heart, an open yet robust, secure, and transparent data infrastructure and a balanced coordination of all stakeholders of the extended mobility ecosystem.

# 1. Defining MaaS

## Lack of a broadly accepted definition

As pointed out recently in a study by the International Transport Forum and the World Business Council for Sustainable Development,[1] the term "MaaS" appears to mean different things to different people. For example, it has been used to mean any application of digital technology in support of mobility; digital apps used to access multiple transport services; commercial offers built on packages of bundled transport services; or more generally, a broad ecosystem of services and stakeholders that allows people to seamlessly access a range of different transport services, many of them shared.

There are almost as many definitions of MaaS as there are authorities, mobility service providers, solution vendors, consultants, and researchers attempting to tackle the topic. Even among the relatively small community of MaaS evangelists and aficionados, there are major differences in the way the MaaS concept is understood and defined.

## Proposed definition for this study

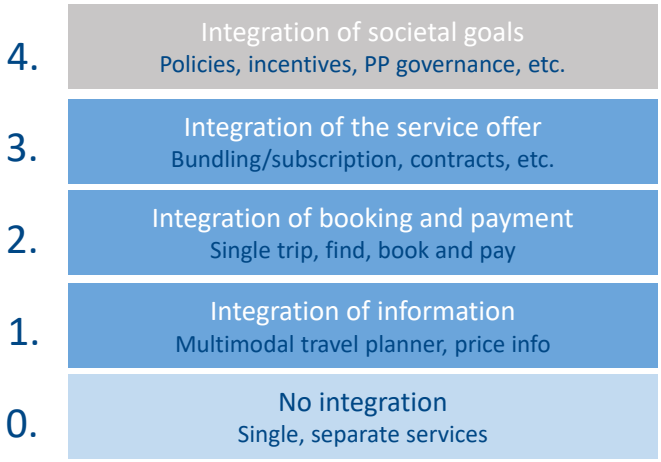
To ensure a shared understanding we will refer in this study to the definition provided by the MaaS Alliance[2] as part of its recent MaaS market playbook:

"Mobility-as-a-Service is the integration of various forms of transport and transport-related services into a single, comprehensive, and on-demand mobility service. MaaS offers end-users the added value of being able to access mobility through a single [digital] application and a single payment channel (instead of multiple ticketing and payment operations). To meet a customer's request, a MaaS operator hosts a diverse menu of transport options, including (but not limited to) public transport, active modes such as walking and cycling, ride/car/bike-sharing, taxi, and car rental or lease, or a combination thereof."

This user-centric definition can be nicely complemented by the more "system-centric" definition provided by ITF and WBCSD,[3] which states that: "Mobility as a Service uses a digital interface and shared data to efficiently source and manage the provision of transport-related services that meet the mobility requirements of people." This definition rightfully identifies the importance of "sourcing" and "managing" the transport services in an efficient way, highlighting the importance of the active role that MaaS plays in contributing to system-level optimization of mobility flows and assets.

There have also been several attempts at defining maturity levels for MaaS endeavors. A useful typology is provided by Jana Sochor, Hans Arby, Marianne Karlsson, and Steven Sarasini,[4] which classifies MaaS value creation into five levels, based on the degree of integration, from 0 (no integration) through to 4 (integration of societal goals), as shown in Figure 1.

Figure 1: Integration levels for MaaS




Source: MaaS topology Sochor, Arby, Karlsson, Sarasini, Holmberg

## Breadth of mode coverage and level of integration

Based on the above MaaS Alliance definition, to qualify as being MaaS a digital mobility service offering should include an extended range of mobility options including, as a minimum, public transit services (considered as the backbone of MaaS), shared mobility services such as car sharing, bike sharing, micro-mobility, and walking.

1 ITF and WBCSD, "The Innovative Mobility Landscape – The Case of Mobility-as-a-Service," July 2021.
2 MaaS Alliance, "MaaS market playbook," March 2021.
3 ITF and WBCSD, Ibid (adapted from Datson, 2016).
4 J. Sochor, H. Arby, M. Karlsson, S. Sarasini, "A topological approach to mobility as a service: A proposed tool for understanding requirements and effects, and for aiding the integration of societal goals," ICOMaaS conference, 2017.

To the extent possible MaaS should also include other mobility options, including demand-responsive services such as taxi, ride-hailing, and on-demand shuttles. These will indeed be critical as MaaS extends geographically to cover rural areas. These demand-responsive services are expected to represent a significant share of MaaS services both in terms of usage and revenues, alongside private mobility devices (PMD) such as owned bikes and e-scooters.

As we will show later in this report, to deliver on their promise, MaaS solutions will increasingly have to encompass all existing public and private mobility options. This means, for example, that a ride-hailing company that only integrates shared and/or micro-mobility options into one single interface would not qualify as MaaS, even if the interface allows for planning, booking, and payment. Similarly, a public transport operator that offers only public transit options, through a similar interface would also not qualify as MaaS.

In addition to breadth of mode coverage, the level of integration of digital mobility services is also a consideration. Integration of access to multiple mobility modes including ticketing and payment channels can be considered as a minimum requirement for MaaS (i.e., Level 2 of the maturity model in Figure 1). Again, as we will show later, MaaS solutions will ultimately need to offer extended integration beyond this, climbing up the Level 4 in the maturity model where MaaS objectives are aligned with sustainable mobility objectives.

# 2. The promise of MaaS

## MaaS can help achieve more sustainable, resilient, and human-centric mobility systems

Based on this comprehensive definition, a mature MaaS has significant potential to help cities achieve the ambition of more sustainable, resilient, and human-centric mobility systems:

- In terms of sustainability, MaaS helps to encourage usage of more sustainable transport modes, moving away from individual cars "by default" toward mass transport, walking, and new mobility solutions such as car sharing, bike sharing, e-scooter sharing, and private mobility devices. It can be an integral part of development of sustainable communities, improving personal health and well-being and enabling greater inclusiveness and accessibility to services for all the city's inhabitants.
- In terms of resilience, MaaS offers accessibility to, and information about, a multitude of mobility options in case of disruptions, with easy and quick access for customers. If properly framed with suitable data regulation, it can also provide authorities with real-time system-level data and information to enable optimization of assets and flows and facilitate a rapid response to disruptions.
- In terms of human-centricity, MaaS offers seamless access to a wide variety of mobility modes to meet differing needs, as well as simplicity and convenience in planning, booking, payment, getting information, and accessing services. It provides customers with the freedom to select preferred mobility options depending on personal preferences and changing circumstances and offers an assurance of availability and predictable time frames.

## MaaS has potential benefits for all stakeholder groups

Conceptually, MaaS is an attractive prospect for the world's cities, with major potential benefits for all stakeholder groups, not just users and society, but also city authorities as well as individual mobility solution providers.

**For customers/users:**

- Provides enhanced mobility experience and flexibility without the need for personal ownership of mobility assets, by providing freedom to move through multiple mobility options based on preferences such as trip duration, mode, cost, and environmental performance.
- Reduces the overall mobility budget for users by offering lower cost of usage vs. the total cost of ownership.
- Enables a shift toward car-free cities, reduced congestion, and greater sustainability.

**For cities and transport authorities:**

- Provides enhanced system-level control and an ability to orient user behaviors constructively toward more sustainable mobility patterns (e.g., increased usage of mass transit, walking, cycling, and new mobility solutions).
- Serves the public good by increasing the accessibility and inclusiveness of mobility services (especially through first- and last-mile solutions), improving service quality and reliability, and integrating tariffs.
- Enables system-level optimization of mobility planning (and associated investments), real-time mobility flows, and asset utilization.

**Mobility solution providers (public and private operators):**

- Improves access to all mobility needs expressed, thereby increasing the addressable market and reducing acquisition and customer support costs.
- Enables better understanding of customer needs through sharing of data among trusted partners (e.g., data on end-to-end journeys and overall mobility patterns).
- Allows for real-time optimization of each of the individual mobility offerings.
- Provides an additional channel for communicating and engaging with users.

## The COVID-19 pandemic is also a driver for MaaS

The advent of COVID-19, although it has had a severe short-term impact in terms of lower demand for passenger journeys and reduced public trust in the safety of shared transport modes, is also ultimately likely to drive the attractiveness of MaaS. For example, MaaS contributes to increased system resilience, provides more customer choice, and enhances the ease of use of multiple mobility options to meet passenger needs and concerns in the post-COVID environment.[5] MaaS also provides real-time multimodal information, taking account of rapidly changing circumstances such as congestion and crowding, allowing passengers to better manage the perceived safety risks of their journey.

5 For further background on the specific impacts of the COVID pandemic on the future of urban mobility, see Arthur D. Little and UITP, "The Future of Mobility Post-COVID," July 2020.

# 3. Where is MaaS today?

### There are some encouraging recent developments

The last few years have seen some encouraging developments in the progress toward MaaS deployment.

Firstly, as mentioned above, the COVID-19 crisis has led to more openness from city and transport authorities toward private mobility service providers (MSPs) being "part of the solution" for future public mobility systems. Historically, new MSPs – such as ride-hailing, car-sharing, e-bikes, and e-scooters – have often had a poor reputation with authorities because of the disruptions they have sometimes caused, the difficulty of regulating their activities, or, in some cases, instances of poor quality and/or safety. However, during the pandemic, many private MSPs demonstrated the positive contribution MSPs can make in increasing the resilience of mobility systems by, for example, offering their services to healthcare professionals and nonprofit bodies and partnering with others to deliver essential goods such as food and medicines.

As the scale and prevalence of new mobility solutions increases, MaaS has become top of mind for policymakers. There is now a much greater interest in developing the possibilities for MaaS and a new willingness to consider the necessary ***framing*** measures, such as policies for data sharing, opening up of ticketing and payments, and new regulations for MSPs; and ***enabling*** measures, such as shared back-end data infrastructures and guidance on new forms of partnership.

Secondly, the supplier base for realizing the necessary building blocks of MaaS has been growing, with the emergence of new actors and partnerships increasingly covering aspects such as (predictive) data analytics, advanced way-finding, and real-time information management. Some suppliers are now also providing new management and orchestration functionalities in addition to the basic "plan-book-ticket-pay" functionalities of traditional MaaS offerings.

Thirdly, there has been an acceleration of digitalization of mass transit ticketing and payment systems although there is still much further to go. Several card-centric systems still need to be upgraded and the multitude of available tariffs often requires more pragmatic approaches for tariff integration, such as the development of ticket shops with limited options to simplify the offering from a user perspective. Although clearly just one element of a MaaS system, ticketing and payment digitalization and streamlining is an essential prerequisite.

Reflecting these trends, even though the implementation of mature MaaS is still in its infancy, we could now be witnessing an acceleration of MaaS deployment. Several new developments have been launched over the past two years in Europe and worldwide (see Figure 2 for an overview of existing MaaS offerings), although many of these are still at pilot stages or with limited mode coverage and functionalities. There has also been a notable increase in public-led MaaS initiatives ("Government to Customer," or G2C, led by public transport authorities or operators), including some that are open to third-party public or private MaaS operators. This is the case in Vienna already, albeit with important limitations, and is likely to be the case as well in Brussels, Paris, and Dubai. That said, there are still several "public walled gardens" where such access is not part of the scheme. We will come back to this issue in Section 4 of the report when we consider key success factors.

Regional MaaS offerings also have been emerging more often over the past few years, highlighting the need for MaaS to cater also for trips where the start and/or destination are in rural areas at the outskirts of cities. The term "rural MaaS" is beginning to be used in this respect. Among recent regional MaaS offerings, examples include yumuv, which covers regions of Zürich, Basel, and Bern in Switzerland; MaaS in Skåne, which covers the southernmost county of Sweden; and Tohoku MaaS by the East Japan Railway Company, which covers more than six prefectures in the northern part of Japan. Also worth mentioning as a different model is Spain's "Renfe-as-a-Service" offering, which is piloting MaaS across the Madrid-Barcelona rail corridor.

Business-to-business (B2B) offerings are also emerging, often driven by automotive distributors or retailers, such as Skipr (by D'Ieteren's Lab Box) in Belgium and France or Shuttel (by Pon) in the Netherlands. These B2B MaaS schemes tend to be linked with fiscal arrangements (the so-called "mobility budget") providing end users with a fiscal incentive to opt for a mobility card (without a car or with a more sustainable car), rather than by default selecting a less sustainable company car.

## Figure 2: Overview of existing MaaS service offerings - Not necessarily exhaustive

| Country | City/Region | Market Model[1] | Name | MaaS Operator[2] | Business Model | Level of integration[3] | Status |
|---|---|---|---|---|---|---|---|
| Austria | Vienna | Open | WienMobil | Wiener Lienen (PTO) | G2C | 2 | Operation |
| | | | Whim | Whim | B2C | 2 | Operation |
| | Countrywide | Closed | wegfinder | OBB | B2C | 2 | Operation |
| Belgium | Antwerp | Liberal | Whim | Whim | B2C | 2 | Operation |
| | Brussels | Open | MoveBrussels | STIB (PTO) | G2C | 2 | Pilot |
| | Multiple cities | - | Skipr | Skipr | B2B2C | 2 | Operation |
| Czech Republic | Praha | Liberal | Citymove | SKODA AUTO DigiLab | B2C | 2 | Operation |
| Finland | Turku | Liberal | Whim | Whim | B2C | 3 | Operation |
| | Helsinki | Liberal | Whim | Whim | B2C | 3 | Operation |
| France | Mulhouse | Closed | Compte Mobilité | Mulhouse Alsace Agglo (PTA) | G2C | 2 | Operation |
| | Saint-Etienne | Closed | Moovizy | STAS (PTA) | G2C | 2 | Pilot |
| Germany | Munich | Closed | MVGO | MVG (PTO) | G2C | 2 | Operation |
| | Hanover | Closed | Mobilitätsshop | GVH (PTO) | G2C | 2 | Operation |
| | Multiple cities | Liberal | REACH NOW | moovel Group | B2C/B2B2C | 2 | Operation |
| | Düsseldorf | Closed | redy | Rheinbahn AG (PTO) | G2C | 2 | Operation |
| | Berlin | Closed | Jelbi | BVG (PTO) | G2C | 2 | Operation |
| | Hamburg | Closed | hvv switch | Hamburg Hochbahn (PTO) | G2C | 2 | Operation |
| | Karlsruhe | Closed | KVV.mobil | KVV (PTO)/Mobimeo | G2C | 2 | Operation |
| | Leipzig | Closed | LeipzigMove | LVB (PTO) | G2C | 2 | Operation |
| | Aachen | Closed | movA | ASEAG (PTO) | G2C | 2 | Operation |
| Italy | Turin | Closed | 5T | City of Turin | G2C | 3 | Pilot |
| | Rome | Liberal | KINTO Go | Toyota | B2C | 2 | Operation |
| Lithuania | Vinius | Liberal | Trafi | Trafi | B2C | 2 | Operation |
| Malta | Malta | Liberal | Meep | Meep | B2C | 2 | Operation |
| Netherlands | Amsterdam | Liberal | Amaze | Amaze Mobility | B2C | 2 | Pilot |
| | Eindhoven | Liberal | Turnn | ICT Group | B2B2C | 2 | Pilot |
| | Limburg | Liberal | glimble | Arriva (PTO) | B2C | 2 | Pilot |
| | Groningen-Drenthe | Liberal | Via-Go | Arriva (PTO) | B2C | 2 | Pilot |
| | Rotterdam/Den Haag | Liberal | Moves | Moves | B2B2C | 2 | Pilot |
| | | | 9292 | 9292 | B2C | 2 | Pilot |
| | | | Tranzer | Tranzer BV | B2C | 2 | Pilot |
| | Twente | Liberal | Goan | Qarin Tranzer | B2C | 2 | Pilot |
| | Utrecht | Liberal | Gaiyo | Gaiyo | B2C | 2 | Pilot |
| Portugal | Lisboa | Liberal | Meep | Meep | B2C | 2 | Operation |
| Spain | Valencia, Malaga | Liberal | Meep | Meep | B2C | 2 | Operation |
| | Barcelona | Closed | Meep | Aena (Airport) | B2C | 2 | Operation |
| | Madrid | Closed | MaaS Madrid | EMT (PTO) | G2C | 2 | Operation |
| | Madrid | | Wondo | Ferrovial (PTO) | G2C | 2 | Operation |
| | Zaragoza | Closed | ZUM | City | G2C | 2 | Pilot |
| | Sevilla | Closed | Meep Sevilla | Globalvia (PTO) | G2C | 2 | Operation |
| | Countrywide | - | RailMaaS | Renfe (RU) | B2C | 2 | Pilot |
| Sweden | Stockholm | Closed | Travis | Nobina (PTO) | G2C | 2 | Operation |
| | Göteborg | Liberal | LIMA | Lindholmen | B2B2C | 2 | Pilot |
| | Countrywide | Closed | Reis+ | Samtrafiken | G2C/G2B2C | 2 | Operation |
| | Skåne | Open | MaaS in Skåne | Skånetrafiken (PTO) | G2C | 2 | Pilot |
| Switzerland | Zurich, Basel, Bern | Closed | yumuv | SBB (RU) | B2C | 3 | Pilot |
| | Geneva | Liberal | zenGo | TPG (PTO) | B2C | 3 | Pilot |
| UK | London | Liberal | Citymapper* | Citymapper | B2C | 3 | Operation |
| | West Midlands | Liberal | Whim | Whim | B2C | 3 | Operation |
| USA | Denver | Liberal | Uber Transit | Uber | B2C | 2 | Operation |
| | Florida | Closed | Brightline | Brightline (Rail) | B2C | 2 | Pilot |
| Australia | Sydney | Closed | iMOVE | SkedGo | B2C | 3 | Pilot |
| Japan | Greater Tokyo | Liberal | Whim | Whim | B2C | 3 | Pilot |
| | Tohoku | Liberal | Tohoku MaaS | East Japan Railway Company | B2C | 2 | Pilot |
| | Fukuoka area | Liberal | my route | Toyota Motor Corp. | B2C | 2 | Operation |
| Colombia | Bogota | Closed | MaaSapp | Vettica | B2C | 2 | Operation |
| Peru | Lima | Liberal | Wego | The Wego Company | B2C | 2 | Operation |
| UAE | Dubai | Closed | S'hail | RTA (PTA/PTO) | G2C | 2 | Operation |

Only MaaS offering from "Level 2" of integration and that are currently active (in pilot or operation) are listed here. This excludes a long list of "Level 1" offerings.
Legend: PTA: Public Transport Authority, PTO: Public Transport Operator, RU: Railway Undertaking

[1] The MaaS market model is influenced by the applicable regulations and the role taken by the public, not solely by the MaaS offering(s) in place.

[2] In some cases the technical operations may be outsourced to a third party acting on behalf of the operator.

[3] To be considered as Level 2 of integration, MaaS offerings must imply full integration of ticketing and payment for at least some of the modes. Integration via deep links is not considered as level 2.

## Yet substantial barriers remain

Despite the positive progress, substantial barriers to MaaS still remain. MaaS operators have often found limited traction among urban residents, and even in markets where MaaS solutions are deployed for quite some time, only a relatively small percentage of the total volume of trips by public transit and other modes is handled through a MaaS app. Some of MaaS's corporate pioneers have also encountered headwinds, with Daimler unloading its Moovel North America unit and UbiGo (a MaaS solution in Stockholm) ceasing its activity following divestment from Via.ID earlier this year. Citymapper is also reportedly facing a shortage of cash. This trend has been recently accelerating with Kyyti (a regional MaaS offering in and around Helsinki) and Zipster (the MaaS offering developed and launched in Singapore by mobilityX, a start-up backed by SMRT and Toyota Tsusho) also ceasing their operations.

So, **is there a real business case for MaaS or are we "going after a ghost"?** To answer this question, it is helpful to consider the current barriers toward MaaS deployment:

- **Lack of a partnership model between public transport operators (PTOs) and third-party MaaS operators:** Deployment of B2C MaaS offerings has not been going as fast as expected. One of the main reasons has been that while integration of public transport solutions is a critical ingredient of MaaS, traditional PTOs are still reluctant to partner with MaaS providers. This has led to a lack of willingness from PTOs to open their ticketing and payment systems sufficiently to third-party MaaS operators and a lack of balanced third-party reselling contracts.
- **Mediocre quality of offerings and customer experience limiting MaaS adoption:** Many MaaS offerings have found little traction among users and there are some common reasons for this:
  - Firstly, there has often been too much focus on "having a MaaS in place" rather than developing relevant, enhanced, quality service offerings that improve the travelers' experience.
  - Secondly, several MaaS offerings are limited in terms of the functionalities they offer. In the absence of advanced multimodal routing capabilities, many MaaS platforms – and this includes several of the most pioneering platforms – plan multimodal journeys based on "quick and dirty" approximations to define the best routes. Many MaaS offerings are also limited in the depth of their integration with MSPs for ticketing and payment and are making use of "deep link" requiring users to access third-party apps.
  - Thirdly, there is often insufficient focus and investment to ensure that the necessary physical solutions and infrastructures to provide the required service and customer experience are present, in addition to the digital components of MaaS. This applies not only to public transport services, which are the backbone of MaaS, but also to other important mobility services. A good example is station-based car sharing, a key mobility service to help reduce car ownership, which today is still characterized in several cities by poor accessibility, flexibility, profitability, and scalability.
  - Finally, MaaS offerings are often too generic rather than being tailored to specific user groups. Tailored MaaS offerings should consider specific mobility needs and patterns within a given city or region. For example, rural dwellers who require regular travel to city centers for work (so-called "pendulars") have very different needs compared to young families with children and no car living in city centers, who have multiple trip purposes such as home-to-work, work-to-school, and travel both individually and in groups.
- **Lack of economic viability:** Consumer-facing (B2C) MaaS offerings are failing to achieve enough scale to become economically viable on their own. Commission-based models especially need substantial scale before they can provide meaningful returns. For example, an urban e-scooter service that sells 20,000 trips per week in a small city might seem to be doing reasonably well. But at a typical average trip price of €5, a commission of 5% yields only €260k/year. This raises the question of the viability of the B2C commission-based model altogether, at least as long as the level of adoption is still low. On the other hand, while the subscription-based model (e.g., "monthly fee to cover your mobility needs"[6]) has a higher financial potential, it is not yet mature, as it will only work if people are already effectively shifting their mindset from ownership to usage. B2B(2C) MaaS offerings, which have been recently introduced across several countries in Europe, are an interesting model: next to accelerating user adoption, these also drive economic viability in the short term through sales of additional business services, such as mobility accounts and travel expenses, which can generate revenue from day one.
- **Benefits to MSPs not materializing:** As mentioned above, MSPs should be enjoying reduced customer acquisition and service costs through having full access to their customers' mobility needs, as well as those of untouched new customer segments, and powerful channels for customer engagement. However, in practice these benefits have not materialized as expected. So far, MSPs generally have

6 See also Box 2 hereafter regarding MaaS subscription models.

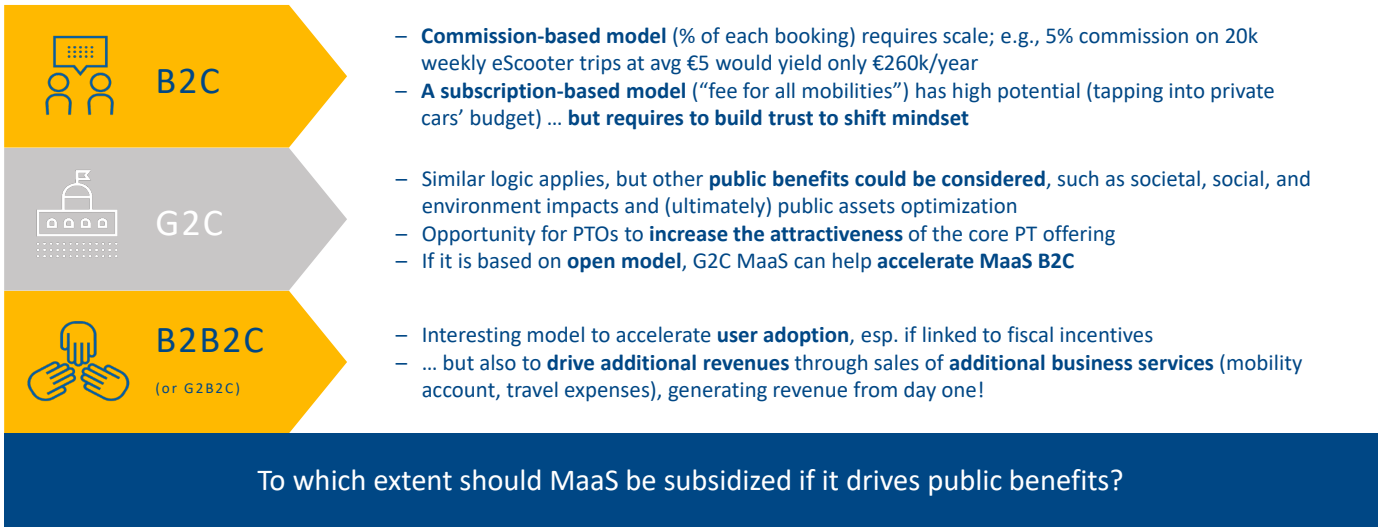
failed to get closer to, and communicate better with, their customers through MaaS. And while this could be greatly improved by sharing data among trusted partners, MSPs have often been reluctant to do so. In most cases this is due to the absence of effective data sharing regulation, including rules regarding bi-directional exchanges, along with the lack of a balanced partnership model between MaaS operators and MSPs. MSPs are also cautious about optimizing their service together with their competitors if it means they risk losing their direct channels or having to share their customers.

The barriers highlighted above are certainly significant today, and the financial business case of MaaS remains questionable if it is considered solely from a private point of view. The path toward MaaS should be seen as a journey that will take time to complete and may often require public stakeholder involvement. Indeed, governments, public transport authorities (PTAs), and PTOs can perform a vital role in this respect by leading MaaS deployment. For example, the business case for a public body to deploy MaaS can legitimately take into account societal, social, and environment benefits and ultimately public asset optimization, as well as considering the commercial returns (see Figure 3). And as we shall explore later, accelerated development of government-to-consumer (G2C) MaaS can also lead to acceleration of private B2C MaaS if it is based on an open market model.

If the public benefits of MaaS are recognized, then the indirect benefits, both tangible and intangible, could make it a good case for subsidy. However, although the G2C subsidy model might lead to a viable financial business case for MaaS since "someone else is paying," it will not solve the problem of lack of adoption. This will only be solved by providing the right level of service quality and customer experience.

In summary, it could be said that MaaS has so far been driven too much by the interests of policy makers looking to make a positive impact and the promise of what could be achieved by new technologies – rather than ensuring that MaaS offerings are sufficiently relevant and attractive to customers, and that there are viable business models in place for both MaaS operators and individual MSPs to survive within an integrated MaaS system. In the next section we will explore some key success factors for overcoming these barriers and making the journey toward a "virtuous" MaaS deployment.

Figure 3: Financial outlook? Limited scale & profitability as yet … but it's a journey!




Source: Arthur D. Little, Future of Mobility lab

# 4. Success factors for driving virtuous MaaS deployment

Our experience advising and working with many of the world's leading cities, mobility service providers, and MaaS suppliers suggests that the barriers are certainly not insurmountable. Virtuous MaaS deployment – by which we mean deployment that is self-sustaining and delivers benefits to multiple stakeholders – is something that is realistically achievable. We have identified five key success factors that mobility players should consider to drive progress.

**1. Recognize that MaaS is not just an app:** Firstly, recognize that MaaS is not just about providing a consumer app to facilitate access to existing transport services:

- A virtuous MaaS in a city or region, at Level 4 maturity in the typology introduced earlier,[7] needs to be part of a broader **mobility vision** that is framed with the right set of mobility policies and regulations, including those related to MaaS and MSPs. It needs to be enabled with the right set of measures to facilitate MaaS deployment and adoption.
- Sufficient focus and investment should also be given to the **physical mobility services** that are critical to provide the required service level and customer experience, as well as to materialize change and drive MaaS adoption. These physical services need to be provided at the right level of quality, accessibility, and price. This includes public transport services, which are the backbone of MaaS, as well as other mobility services, including shared, micro, and demand-responsive services.
- In order to provide seamless mobility and foster an increase in multimodal trips, adequate focus should also be given to **infrastructures**, such as mobility hubs, which are essential to improve multimodal customer accessibility and experience.

**2. Frame and enable the right MaaS market model:** Secondly, ensure that the right MaaS market model is in place for virtuous market development:

- Generally, one single MaaS offering is unlikely to meet the needs of a city or region. It is the availability of multiple offerings that will ultimately provide an attractive user experience and drive acceptance, provided that they are all interoperable.
- An **open market model** is in our view the most appropriate to support realization of sustainable mobility goals and allow for system-level optimization of flows (see also Box 1 below). In this model there is an active engagement of the public sector, establishing both technical and non-technical enablers. This includes a shared public back-end platform and a unified mobility data lake, but the system is open to third-party private MaaS operators to deploy B2C or B2B services, including distribution of public transport services under balanced conditions. The open market model should also be **modularizable**. Some third-party MaaS operators may want to benefit from the full set of public back-end functionalities, such as city journey planner, integrated ticketing interface, transaction settlements, etc. Other operators who have their own full stack MaaS platforms may wish to limit their interaction to sharing relevant data and using only selected functionalities.

MSPs should also be actively managed by authorities. Key aspects of this include: making sure that the right MSPs are in place to provide the required level of customer service; regulating them to ensure they share their data, including data related to services that are sold through the MaaS platform; regulating them to ensure they open their ticketing and payment systems to third-party MaaS apps; and providing beneficial conditions for MSPs to operate and attract customers. This could include, for example, free parking, favorable congestion charging regimes, targeted subsidies, or access to datasets from indirect customers. Many public authorities and operators will need to open up and revise their mission, role, and capabilities in order to effectively manage MSPs in this way.

**3. Adopt a truly need- and experience-based approach:** Thirdly, ensure that MaaS service design and value propositions build on an understanding of customer needs and genuinely improve user experience, which is essential to drive adoption. This means:

7 J. Sochor, H. Arby, et al., Ibid.

- Understand, segment, and profile the mobility patterns and specific needs of different user groups, from commuters through to seniors and parents with small children. MaaS solutions need to be carefully targeted to address the real needs of user groups. It is important first to fix any shortfalls, meet basic needs, implement improvements to the service, and only then focus on providing some "delight" attributes. Some MaaS solutions have failed because they focused too much on the latter without dealing properly with the former.
- Ensure that value propositions, by which we mean combinations of service options offered against different prices, are designed according to customer needs, easy to understand, and incentivize "smart behaviors" that benefit both the customer and the operator and contribute to realizing policy goals such as reducing congestion or environmental footprint. Subscription-based pricing models may be appropriate in some cases (see Box 2).

**4. Develop an appropriate sourcing and partnering strategy:** Fourthly, for public mobility actors wanting to nurture an open MaaS ecosystem, including through the development of an open back-end platform, there is a need to develop a suitable sourcing and partnering strategy for the design and build of a technical MaaS solution that will fully meet their requirements, both now and in the future. Key questions include:

- What roles should they play, what will be delivered in-house, and what will be outsourced?
- Can the desired solution be sourced by deploying and customizing an off-the-shelf solution from a single vendor, or will solutions and building blocks from multiple vendors be required to achieve the necessary degree of customization?
- Is it better to have a single turnkey delivery partner, or a lead consortium, or alternatively a more open partner ecosystem with multiple players?
- How should IP rights be managed, given that vendors might be less willing to invest if their rights are not protected?

Transport authorities and PTOs alike need to ensure that their sourcing and partnering strategy provides them enough flexibility to be able to deploy key new technologies and innovations as and when they become available, avoiding overdependency on a single supplier and extended lock-in to specific technologies. Doing this, however, requires agility as well as strong skills and capabilities in managing an ecosystem network of supply partners.

**5. Proactively manage your ecosystem:** Finally, development and deployment of a virtuous MaaS is inevitably a complex endeavor involving an ecosystem of many different stakeholders, both public and private. This will include:

- Public functions such as urban, environmental, economic, financial, and social planning as well as mass transit operators.
- Private mobility service providers (on-demand, shared, micro) and infrastructure managers.
- Software providers involved with the design and build of the technical solutions, as well as providers of smart infrastructures, the nature and number of which may evolve over time.
- Representatives from businesses, associations, and civil society.

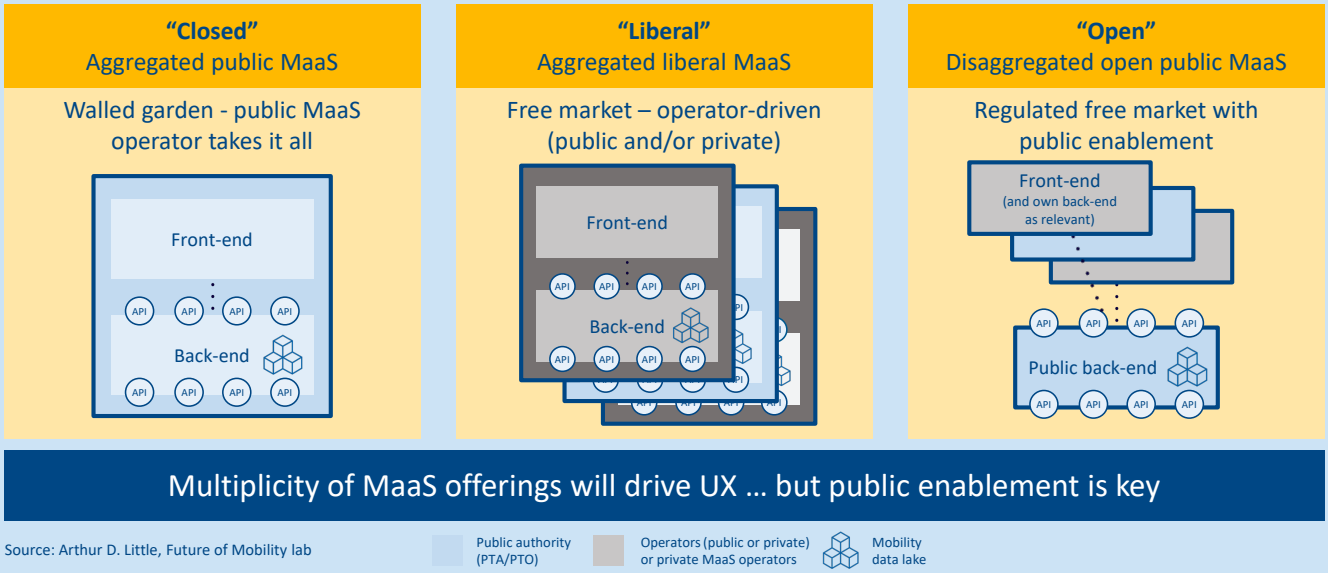
At the outset it is important to understand the goals and motivations of each stakeholder. Common, win-win goals should then be defined, based on a shared understanding of customer needs, policy goals, as well as associated MaaS solution requirements. Successful collaboration over time will then form the basis for trusted relationships. To that effect, authorities – often supported by PTOs or other public actors – will need to evolve from being regulators ("framing") to being partnership managers ("enabling"), which in some cases will require a major shift in role, capabilities, and culture.

## Box 1: Which market model is best for MaaS?

The market model for MaaS in any city, region, or nation essentially will be driven by the applicable regulatory framework for data sharing and mobility services distribution (implying open ticketing and payment scheme) and by the willingness of public and private mobility actors to collaborate with each other. The applicable market model has a huge impact on the achievable maturity of the MaaS ecosystem, the viability of the business case for MaaS operators, and ultimately on the ability of MaaS to contribute to more sustainable, resilient, and customer-centric mobility systems.

Three types of market model can be distinguished: Closed, Liberal, and Open, as shown in Figure 4.[8]

Figure 4: Overview of MaaS market models




In the **Closed** model, also referred to as "aggregated public MaaS" model, a PTO or PTA develops and operates a G2C and/or G2B MaaS platform. In this walled garden approach, public transport data and ticketing application programming interfaces (APIs) are closed to third parties. Private MaaS operators are therefore prevented from operating a B2C MaaS that includes public modes. The public-led MaaS offering will comprise public transport modes as well as other private mobility solutions integrated under its own conditions. The MaaS concepts developed in cities such as Berlin (Jelbi), Mulhouse (Compte Mobilité), Munich (Mein GVH), and Dubai (S'hail) have been built according to this model. The main drawback of the model is that it restricts free market dynamics and limits innovation. In some countries and regions (such as Europe), this model also risks becoming obsolete due to the advent of regulations to enforce data sharing and opening of ticketing APIs.

The **Liberal** model, also referred to as "aggregated liberal MaaS" model, builds on the premise of openness of PT data and ticketing APIs, thereby allowing one or several public and private actors to develop and operate MaaS platforms. This model is currently implemented in cities such as Helsinki and Antwerp (Whim), London (Citymapper), and Denver (Uber). The positive aspect of this model is that it fosters free market dynamics and innovation. However, the multiplicity of platforms along with the absence of a master mobility data lake makes system-level optimization of flows and assets very difficult, ultimately limiting the ability to realize sustainable mobility policy goals. At the very least, strong regulation and governance is needed to ensure satisfactory performance at the overall system level.

8 A first iteration of those models was introduced in Arthur D. Little and UITP "Future of Mobility 3.0 – Reinventing mobility in the era of disruption and creativity," March 2018.

In the **Open** model, also referred to as "disaggregated open public MaaS" or "regulated utility MaaS" model, one or more PTAs and/or PTOs develop and operate a MaaS back-end platform as well as a unified mobility data lake, integrating data from public transport as well as other connected private mobility service providers and the mobility infrastructure. This will typically include a G2C and/or G2B MaaS platform operated by the local PTO, but also private MaaS operators deploying their own B2C (or B2B) MaaS offerings. The main positive aspect of the model is that, if properly framed, it will allow for system-level optimization of planning and operations and realization of sustainable mobility policy goals, while also fostering free market dynamics and innovation. The main challenge of this model is that it requires PTAs and PTOs to jointly stand up to ensure that several conditions are met. Firstly, it requires the development of the public back end and mobility data lake. Secondly, it requires effective data-sharing regulations and data exchange standards to be developed to ensure that data from all mobility service providers is accessible. Finally, and importantly, it requires PTOs to open up their ticketing and payment systems so that third-party B2C MaaS operators can distribute their services.

The deployment of the Open model is currently limited to a few cities. Vienna (Upstream) has been the pioneer, although full deployment is restricted by the absence of comprehensive data-sharing regulations and open ticketing being limited to single tickets. Over recent years, several other cities have expressed willingness to deploy, or adapt to, the Open model, including Paris, Brussels, and Dubai.

While the Open model is relatively simple to understand in theory, it represents a radical change in the way urban mobility is typically governed and organized. Making it work effectively in practice, and in a way that overcomes the current barriers and limitations as outlined above, will thus be challenging. The deployment of such a model could however be a critical enabler for setting the conditions to allow a viable business (or "societal case") for MaaS.

A fourth model that is sometimes being referred to[9] is the so-called **Mesh-y MaaS** model, built on the basis of distributed APIs by all mobility service providers, integrated automated transaction processing, vetting and clearing using distributed ledger technology (DLT), and automated contracts. In our view, this setup is not to be considered as an additional market model, but more as a different way to apply existing models. If supported by the right regulatory framework, such a setup could overcome some of the limitations of the Liberal model, as it would allow for the development of a "roaming ecosystem," provided that there is an entity to coordinate the uptake. Similarly, it would also allow the Open model to be implemented without requiring a unified mobility data lake. However, it is still theoretical at this stage as it has not been deployed in any city, either fully or in part. The setup is also expected to have some drawbacks; for example, there are limitations in the achievable volume of real-time data treatment and limited access to historical data, which would prevent some of the more advanced functionalities of enhanced MaaS (as presented in the next chapter) from being achieved.

9 UITP, "Ready for MaaS? – Easier mobility for citizens and better data for cities," May 2019; ITF and WBCSD, Ibid.

## Box 2: Using the right subscription-based MaaS pricing model

MaaS value propositions that encompass subscription-based pricing are often considered critical for the future development of MaaS. There are several reasons for this. Firstly, subscription-based pricing aligns with the notion that MaaS can become a substitute for private car ownership, for which households already effectively set aside a monthly budget. For example, LeasePlan's Car Cost Index,[10] indicates a total cost of owning and operating a car across 18 European countries at between €491 and €926. A similar study by AAA Automotive[11] in the US estimates a monthly cost of US $797.

A further consideration is that if MaaS is to be seen as a real alternative to the use of individual car "by default" – if not fully substituting, then at least offering a viable alternative to owning a second car – it must offer the same convenience of being "always available." The idea of unlimited access to mobility that would be provided by a subscription fee is therefore considered as an important selling point by many.

10 LeasePlan Corporation, "Car Cost Index," September 2020 (costs are averaged over four years of ownership and assume an annual mileage of 30,000 km).
11 AAA Automotive, "How Much Does it Really Cost to Own a New Car?" 2020 (costs averaged over 5 years of ownership, assuming an annual mileage of 15,000 miles, ≈241,000km).

One of the lessons of the several MaaS pilots, which have included subscription-based pricing, is that such bundles make it easier to pursue one or more policy goals, such as sustainability, and easier to specify and advocate the attractiveness of MaaS to end users. For example, one pilot concluded, "Without subscription bundles it can be argued that we have a limited specification of MaaS, essentially a multimodal trip planning app, which has a vague connection (if any at all) to sustainability goals."[12] This appears to be not so easy to achieve with pay-as-you-go schemes.

The subscription model is also often cited by B2C MaaS operators to underline the fact that both private MaaS operators and PTOs have a shared objective to incentivize usage of public transit. With a fixed-fee pricing model, it is in the interests of the B2C MaaS operator to incentivize the use of lower-cost public transit modes (as well as walking and cycling), rather than other higher-cost solutions such as car sharing or e-scooters, to maximize operating margins.

Finally, the move toward subscription-based models is also a trend within the automotive sector, which is rethinking its sales models beyond ownership to meet the growing customer desire for flexibility.[13] If one of the goals of MaaS is to develop a credible alternative to car ownership, it is important for MaaS to propose subscription-based models, as they provide a guarantee of available services (volume) as well as price predictability.

However, there is often a misconception about MaaS subscription-based services (Level 3 in the typology introduced earlier[14]) that they have to be based on an "all you can travel" fee for all mobilities. In fact, we do not expect to see such value propositions being offered or adopted in the near future. This is because they would need to price very high in order to avoid the risk of negative margin for the MaaS operator. The cost and convenience of different mobility services differ significantly, and given the choice users may favor more convenient and more costly services over cheaper ones. Furthermore, such a value proposition would do little to contribute to the goal of more sustainable mobility, since there would be no incentive to use mobility solutions with less burden on the environment.

For these reasons, from an economic and environmental point of view, a subscription fee to cover "all your mobility needs" makes more sense than a fixed fee for "all you can travel." The key difference is that there would be different subscription levels, with specific usage caps for those services that have a high cost and/or a high burden on the environment, such as taxi or car rental services. Such models could combine flat as well as variable fees to allow for some level of flexibility, based on what makes sense to both customers and the business.

A good example is the UbiGo (Stockholm) pricing model. It included different subscription levels per mode; for instance, a certain allowance of hours of car use per month, with every hour including booking fee and distance fee. The hour allowance could be used not only for car sharing but also car rental, and the hours not used could be shared with other members of the household or saved up and transferred to the next month. This provided an incentive not to overuse higher cost and less environmentally friendly services, as well as allowing customers to find the right subscription level to meet their needs across different categories, with the price per hour varying depending on volume used. A similar approach was used for other mobility services; for example, day tickets for public transport or monthly rent of a commuter bike, which was included in some, but not all, subscription bundles.

12 iMOve Australia, "The Sydney Mobility-as-a-Service trial: Design, implementation, lessons and the future," March 2021.
13 See Arthur D. Little, "Car subscription schemes – Ownership model of the future or marketing stunt?" June 2021.
14 J. Sochor, H. Arby, et al., Ibid.

# 5. Moving toward a Unified Mobility Management Model "beyond MaaS"

Applying the five key success factors outlined in the previous section will overcome most of the current barriers to virtuous MaaS deployment. But will these be sufficient to realize the full promise of MaaS to achieve the ultimate goal of sustainable, resilient, and human-centric mobility systems?

We believe that to fully realize the promise and go "beyond MaaS," six further requirements will need to be met over the coming years.

**1. Coverage of all relevant modes (including private cars!):** Cars will not be disappearing from our roads anytime soon, especially in rural areas. However, a properly framed MaaS offering can improve the attractiveness of the shared mobility system by having mass transit as core and new mobility modes for the first and last mile, so that it can become a viable alternative to "private car by default." Exhaustivity of mode coverage is therefore a strong enabler to improve the overall attractiveness of the MaaS offering. Moreover, the need for system-level optimization of mobility – planning as well as real-time optimization of flows and assets – implies that data from all mobility, not only data from the mobility services that are sold via MaaS, should be included in the system. This should include both privately owned cars and "not-so-private cars," following the introduction of usage-based subscription models by automotive OEMs.[15] Finally, inclusion of private cars in the system will provide users with an objective comparison of alternative mobility options and how they perform, which could trigger a change of behavior toward more sustainable options if these offer the right service level. However, realizing this integration in practice will be complicated. Global automotive OEMs may not be willing to share their data unless they are obliged to do so; similarly, car owners driving in a private capacity will also be reluctant to share data.

**2. Integrate goods movement with mobility services:** Movement of goods accounts for a large and increasing share of the traffic flow within cities, a trend that has been accelerated by the pandemic as customers choose e-commerce over physical shopping. Linked with the above considerations, and to enable system-level optimization and coordination, we see the need for further integration between MaaS and Logistics-as-a-Service (LaaS) in the future.

**3. Further integrate and modularize infrastructures:** The requirement for further development of multimodal infrastructures, such as mobility hubs, has already been cited as a success factor. However, this is only the tip of the iceberg and infrastructure is expected to play an increasing role in the future of MaaS:

- As the smart city concept is further developed and deployed, MaaS will increasingly become part of broader infrastructure initiatives to manage public space more dynamically. One of the most obvious areas of integration will be parking infrastructure, where there will be increasing convergence between MaaS and smart parking players that are deploying new parking technologies leveraging Internet of Things and smart sensors. Increased collaboration between MaaS and real estate actors is also to be expected, since parking, or a MaaS-based alternative to parking, is often considered as a key service for tenants. This is increasingly important given growing restrictions in available personal parking space in cities, making parking space ownership very expensive. These types of partnerships may help to make MaaS more economically viable, lowering the effective acquisition cost per user by allowing the critical local number of users to be reached more easily, similarly to the B2B MaaS model. They can also increase access to space for shared services (mobility hubs).
- An evolution toward increased infrastructure modularity and flexibility is also expected, for which MaaS integration would be very valuable. The most common illustration of infrastructure modularity is dynamic curb management, in which space is repurposed across different times of the day to fulfil different functions, such as goods delivery or leisure activities requiring extended outside seating. This principle is expected to be further applied to other mobility infrastructures such as stations for crowd management or, possibly, remote working space.

15 Arthur D. Little, "Car subscription schemes," Ibid.

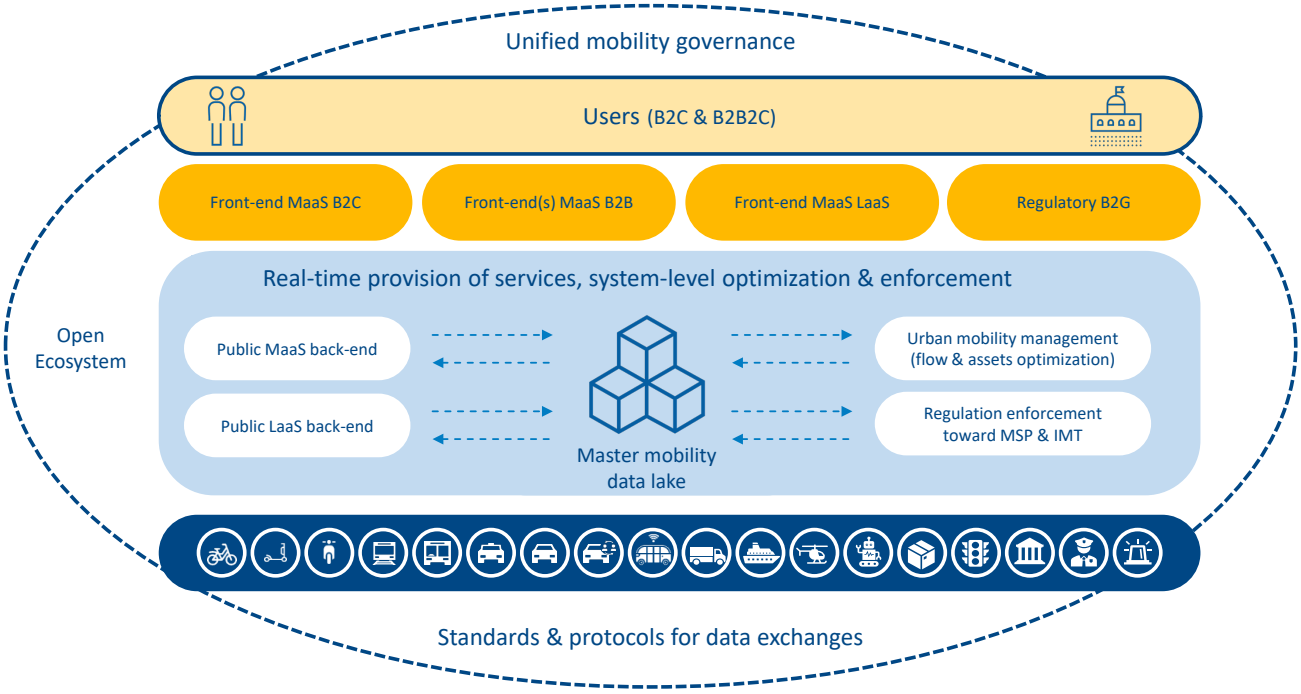
**4. Geographical extension:** If MaaS only extends as far as the city boundary it is of little use to the many users who need to travel in and out from the surrounding region and elsewhere. A key enabler therefore is the development of regional MaaS systems that extend outside the city, as well as inter-city MaaS modes. Such extensions bring into play the topic of the technical interoperability across different MaaS systems, implying the need to tackle difficult topics such as identity handling (with all the risks and complexity that regulations like GDPR would involve), inter-city service roaming and clearing. Beyond the technology challenges, there will also be a range of governance and change issues to address: finding common ground across stakeholders will be more difficult, and managing extended ecosystems will be more complex.

**5. Management and dynamic regulation of MSPs:** From a system-level perspective, realizing the promise of MaaS poses challenges around the changing patterns and complexities of traffic flows and modes at any one time. MaaS endeavors have so far mostly focused on trying to influence the **demand**, through increasing the visibility of alternative mobility options and increasing the accessibility and experience of multimodal trips, thereby nudging users toward adopting more sustainable mobility services. Current MaaS systems do not sufficiently focus on trying to influence the **supply** (MSPs) and on improving system-level **orchestration** of the supply and demand. The introduction of functionalities related to the management and enforcement of the supply and system-level orchestration is a key area for improvement. This may involve enforcement mechanisms; for example, automatically imposing penalties to MSPs if they exceed regulatory limits that could adversely affect the functioning of the wider mobility system, such as exceeding speed limitations or agreed limits on the number of e-scooters on the road at any one time. This will require MSP regulation to be translated into dynamic algorithms that can digitally monitor key parameters. This can also involve "supply management" mechanisms aimed at MSPs; for example, providing targeted and real-time trip-based subsidies for trips, which may not be financially viable for MSPs in themselves but are important for the effectiveness or sustainability of the mobility system as a whole, such as the first and last mile of a multimodal trip.

**6. Holistic open ecosystem:** The Open market model for MaaS has already been highlighted as the most appropriate for virtuous MaaS deployment (see Section 4). As the concept of smart cities develops further (including, for example, autonomous vehicles), this model will be even more essential. A holistic traffic management approach will be needed to manage mobility flows and congestion, for which an enhanced "master mobility data lake" will be essential.

A Unified Mobility Management Model[16] as shown in Figure 5 embodies the necessary technical and non-technical features of such an ecosystem. It covers both passenger and goods mobility; it provides the ability to optimize both mobility flow and assets, including dynamic management of public space; and it embodies dynamic management of enforcement and funding.

Figure 5: Unified Mobility Management Model




Source: Arthur D. Little, Future of Mobility lab

16 The concept of Unified Mobility Management Model was first introduced in Arthur D. Little and UITP, "Future of Mobility post-COVID," July 2020.

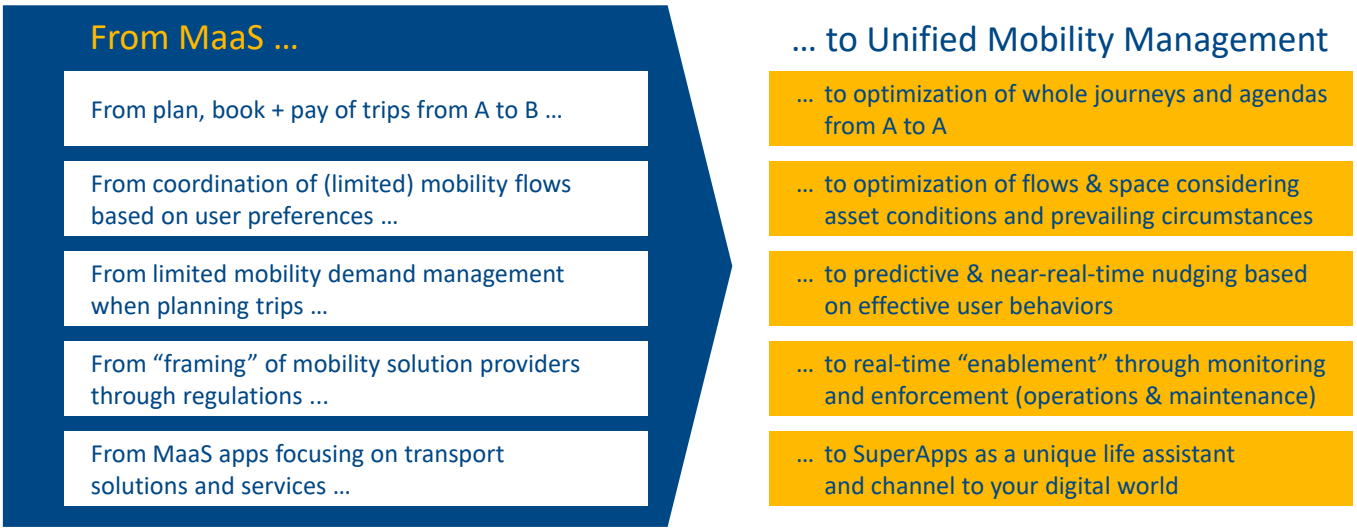
Standards, protocols, and regulation are in place for mandatory data exchanges and rights management across all modes and under fair conditions, avoiding the used of "walled gardens" only accessible to a limited number of parties. A robust, secure, and transparent data infrastructure is provided that can handle in real time all mobility-related data, whether generated by moving or fixed parts of the mobility system, whether privately or publicly owned/operated, and whether shared or unshared. A middle layer ensures real-time provision of services and management with empowerment of all actors, making maximal use of their respective capabilities and expertise.

PTAs and PTOs can play an important role in orchestrating such a Unified Mobility Management Model and driving a change toward widespread adoption of MaaS. This will, however, require them to evolve their roles considerably, requiring new capabilities that most do not currently possess. The extended role comes with greater responsibilities that cannot be easily placed into the hands of one or two actors.

Collaborative governance, including the involvement of government and authorities across multiple mobility domains, public mobility players, private mobility players, as well as user representatives, will therefore be key to providing assurance that the outcomes will benefit the system as a whole.

The Unified Mobility Management Model could contribute to solving many of the issues we face in bringing about sustainable, resilient, and human-centric mobility systems with MaaS at their core. Deployment of such a model could take mobility systems well "beyond MaaS" to a place where sustainability, resilience, and human centricity can be realistically achieved (see Figure 6).

Figure 6: Beyond MaaS




Source: Arthur D. Little, Future of Mobility lab

# Conclusions

MaaS may not yet have delivered on its early promises, but deployment is a journey with many intermediate stages and there are huge benefits ahead that justify continued efforts.

While some MaaS enablers have materialized over the past few years, further effort and openness is required, especially by city authorities and public transport operators. They need to ensure that all the necessary requirements are met to allow for a "positive business case" for MaaS for the benefit of all stakeholders: the customers/users, the city authority, the public and private mobility services providers, as well as the MaaS operators themselves.

MaaS is not just an app, and successful deployment requires a comprehensive approach, including strategic, technical, regulatory, and change considerations. We have identified five key factors for success to overcome the barriers and achieve virtuous MaaS deployment and six further requirements to move "beyond MaaS" toward sustainable, resilient, and human-centric mobility systems.

Realizing the MaaS promise will require increased collaboration among stakeholders. We believe that a Unified Mobility Management Model, supporting an open public MaaS ecosystem, would greatly help to fully extract value for the benefit of all the stakeholders and help to reach the ultimate goal.

Arthur D Little

# Arthur D. Little's Future of Mobility lab

As the world's first management consulting firm, Arthur D. Little has been at the forefront of innovation for more than 125 years. Arthur D. Little is acknowledged as a thought leader in linking strategy, innovation, and transformation in technology-intensive and converging industries.

The Future of Mobility (FoM) lab, launched in 2010, is Arthur D. Little's contribution to tackling the urban mobility challenge. With this lab, Arthur D. Little aims to support cities, as well as public and private actors, in shaping the extended mobility ecosystems of tomorrow and facilitating an open dialog between urban mobility stakeholders.

Arthur D. Little's Future of Mobility lab gathers under the same roof cross-industry and cross-functional professionals to support governments, authorities, mobility solution providers (public and private), and investors in shaping their roles in future mobility ecosystems, through:

- Performing foresight analysis and developing medium- to long-term mobility scenarios in uncertain environments.
- Advising governments and authorities on the definition of mobility vision, policies, and roadmaps at national, regional, or city level, preferably through a collaborative approach involving key public and private mobility stakeholders.
- Performing opportunity assessment and due diligence of innovative business models and solutions.
- Supporting new mobility actors in defining most appropriate business model and go-to-market strategies.
- Assessing urban mobility systems (maturity, performance, and innovativeness) as input for policy development, tendering tactics development, or go-to-market strategies.

> The Future of Mobility lab is Arthur D. Little's contribution to tackling the urban mobility challenge. Arthur D. Little aims to use its Future Lab to support actors shaping extended mobility ecosystems of tomorrow and as a catalyst to enable and facilitate an open dialogue between mobility stakeholders
>
> – Ignacio Garcia Alves, Arthur D. Little Global CEO

1. Foresight analysis and mobility scenario development in uncertain environment
2. Definition of national/regional/urban mobility vision, strategies, and roadmaps
3. Opportunity assessment & due diligence of innovative business model and solutions
4. Go-to-market strategies (incl. setup of multi-stakeholder ecosystems)
5. Assessment of mobility performance (Urban Mobility Index)

www.adl.com/futuremobilitylab

# Beyond MaaS

"Beyond MaaS" is the name behind Arthur D. Little's advisory services related to Mobility-as-a-Service (MaaS). This name reflects the importance of a comprehensive approach when embarking on a MaaS journey, one that goes Beyond the traditional way MaaS is considered. Our "Beyond MaaS" services ranges from MaaS vision and strategy development, system-level maturity diagnosis, design of the target MaaS solution architecture, as well as overall program management (from concept to run) and management of the partner ecosystem. What sets us apart is the depth of our understanding and practical experience as well as the comprehensiveness of our approach, which encompasses strategic, technical, commercial, and regulatory dimensions, as well as overall program management and stakeholders engagement.

If you have specific enquiries or would like to arrange an informal discussion on MaaS and new mobility issues and how they affect your business, please contact futuremobility.lab@adlittle.com.

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How to realize the promise of Mobility-as-a-Service

## Arthur D. Little

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