

MaaS in Europe: Lessons from the Helsinki, Vienna and Hanover experiments

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Often presented as a tool to revolutionise the use of mobility services, Mobility as a Service (MaaS) refers to a digital service that allows travellers to access a wide range of collective, shared or private transport services, in a given area. Many MaaS systems are developing in large urban areas. Based on a smartphone application, they provide travellers with more personalized and easily accessible mobility services. However, the concept of MaaS reflects very different realities from one urban area to another. This paper offers insights into the design, implementation and effects of MaaS services based on the experiences of three pioneering cities in Europe: Helsinki (Whim), Vienna (WienMobil) and Hanover (Mobilitätsshop).



Location of MaaS examples analysed

MaaS: what are we talking about?

Variable levels of integration behind the MaaS concept

The principle of MaaS is to integrate different transport services into the same mobility offer. However, the concept is still a recent one, and there is no unanimous definition. As most commonly understood, it is considered to be an integrated system providing information, reservation, purchase and validation of tickets for the widest possible range of mobility services. This is done through a single account where passengers define their profile and preferences and manage their purchases and payments for all means of transport.

From the standpoint of the user, the level of integration of different mobility services varies from one MaaS to another. A typology of MaaS services (Sochor et al, 2018¹) distinguishes 4 levels, depending on the degree of integration:

- The minimum level (level 1) concerns the integration of information: the system is in this case a multimodal route planner providing fare information.
- The intermediate levels also allow passengers to purchase and validate their tickets, either individually (level 2), by subscription or in the form of packages giving rights to access different mobility services (level 3). The three MaaS systems in Vienna, Hanover and Helsinki are at these intermediate levels.
- Finally, in the most integrated systems (level 4), MaaS takes into account societal objectives, such as encouraging the use of the most virtuous means of transport.

| Level of integration from the passenger's point of view | Examples of MaaS |
|---------------------------------------------------------|---------------------------------------------------------------------------------|
| 4 | Taking societal objectives into account (by public policies, incentives, etc.) |
| 3 | Integration of information, booking and payment (subscriptions, packages, etc.) |
| 2 | Integration of information, booking and payment (single trips) |
| 1 | Integration of information only (multi-modal planner) |



Tramway in Helsinki

Typology of MaaS service and positioning of services that have been benchmarked (after Sochor et al, 2018)

Towards rural MaaS? MaaS services generally cover large urban areas. But in Finland, several pilot projects are aiming to develop MaaS services in rural areas. Unlike urban MaaS systems, these projects include one or more actions directly related to the mobility offer, ranging from optimising or decompartmentalising existing mobility offers to creating new mobility services, generally in the form of demand-responsive transport or shared taxis. Other projects aim to create MaaS services on a regional or even international scale.

Numerous expected benefits for a targeted clientele

There are many benefits that a MaaS system could provide for the mobility system.

- For **local authorities**, MaaS is a tool that facilitates information and access to the various mobility services. By providing a door-to-door mobility offer, MaaS can encourage a modal shift from solo car use to other modes and have positive effects in terms of social inclusion or limiting pollution emissions. MaaS can also be an opportunity to collect more accurate data on mobility practices, which can contribute to better planning and adaptation to the needs of transport supply.
- For **transport operators**, MaaS offers new sales and information channels, as well as new fare products that not only build loyalty among their regular users, but also reach out to new customers. By facilitating intermodality, MaaS also makes it possible to boast a door-to-door mobility offer. This helps to increase the use of the collective or shared mobility services, and thus to improve their economic efficiency.
- For **passengers**, MaaS offers easy access to a wide range of mobility services, giving them more choice and more comfort in use: unified information about all mobility services to make travel easier and help them to make informed choices of means of transport, making it easier to purchase tickets, etc.

¹ Sochor J., Arby H., Karlsson M., Sarasini S. (2018), [A topological approach to Mobility as a Service: A proposed tool for understanding requirements and effects, and for aiding the integration of societal goals](#), *Research in Transportation Business & Management*, vol. 27, pp 3-14.

What is the target clientele for MaaS? The MaaS services observed as part of this benchmark operation mainly target three main categories of passengers:

- **Private car users.** The purpose of MaaS is to encourage a modal shift by providing comprehensive information on alternatives to the car and making them easier to use.
- **Multimodal passengers** who use public transport and other shared mobility services on a more or less regular basis. The purpose of MaaS is to build loyalty among these passengers by providing them with greater ease and comfort of use for these various services, and to restrict the use of private cars.
- **Tourists.** MaaS can be an opportunity to provide an integrated and easily accessible mobility offer for visitors discovering the town, thereby offering them a better tourist experience. This requires a specific communication strategy.

A recurring difficulty for MaaS operators is to identify the needs of users in order to offer products that bring real added value to their customers. In Helsinki, MaaS Global successively launched several packages, to assess the demand for certain types of products.

MaaS in practice: analysis of offers in Helsinki, Vienna and Hanover

Analysis of the MaaS services set up in Helsinki, Vienna and Hanover shows very contrasting approaches. A first difference is the diversity of the mobility services included in these services:

- In **Helsinki**, the Whim application is the most integrated example, both in terms of features and range of accessible mobility services. In addition to public transport, Whim offers direct access to bike sharing, taxis, car-sharing and conventional rental cars. These services are booked and paid for directly via the application.
- In **Vienna** and **Hanover**, the WienMobil and Mobilitätsshop applications have lower levels of integration. They provide direct access to public transport and allow people to pay for the corresponding ticket. Only the route planner is integrated for other modes of travel. In Hanover, users therefore have to call the taxi company to book a journey, and to set up an account on the car-sharing service application in order to access the service. Payment is made directly to the service operator, not via the Mobilitätsshop application. In Vienna², the WienMobil application similarly links to the car-sharing and bike-sharing service applications for booking and payment, and offers to call to the taxi company.

In all cases, the integration of the different mobility services is never total: some mobility services are not accessible via the MaaS application. This is due to service operators not wanting to integrate MaaS, technical difficulties in integrating these services within MaaS, or the MaaS operator wanting to limit the diversity of accessible services or not to include competing services within the same offer.

² In Vienna, the operator MaaS Global introduced a new MaaS offer in October 2019, called Whim, as in Helsinki, and in all urban areas where MaaS Global has rolled out its services. As Whim was launched commercially in Vienna only after our visit, this service is not analysed in detail here.

Public transport, however, is an essential component of any MaaS offer. In Helsinki, as in Vienna and Hanover, all local and regional public transport (buses, trams, metros, regional trains, ferries, etc.) are systematically accessible via the MaaS application. This is partly explained by the fact that, in these three urban areas, all of these modes have historically been integrated within the same transport network, both in terms of information, ticketing and fare system. In any case, it does not seem conceivable to propose a MaaS offer that does not include all public transport.



Vienna Underground

| | whim Helsinki | WienMobil Vienna | Mobilitätsshop Hanover |
|-------------------------|-------------------------|----------------------------|----------------------------------|
| Main line trains | × | × | × |
| Regional trains | ■ | ■ | ■ |
| Underground, Tram, Bus | ■ | ■ | ■ |
| Bike sharing | ■ | ■ | × |
| E-scooter sharing | × | ■ | × |
| Moped sharing | × | ■ | × |
| Car-sharing* | ■ | ■ | ■ |
| Taxis* | ■ | ■ | ■ |
| Car service with driver | × | × | × |
| Personal bike | ■ | ■ | ■ |
| Personal car | × | ■ | × |
| Rental car | ■ | × | × |
| Car park* | × | ■ | × |

Range of mobility services accessible via the MaaS application
 ■ Route calculation, booking, ticket purchase and validation
 ■ Route calculation only × Non-integrated service * Some operators only

A second difference is the type of access options to mobility services offered by the MaaS application. Several models coexist, ranging from the non-subscription option “Pay-as-you-go” to packages including unlimited access to a range of services.

- In **Helsinki**, the innovative character of the Whim system lies in the multimodal packages on offer. These packages range from less than €60 per month for the use of public transport, bike sharing and taxis (with a maximum charge of €10 for journeys of less than 5 km) to €499 per month for unlimited use of public transport, bike sharing, car-sharing (up to 2 hours of use per day), conventional hire cars and taxis (for journeys of less than 5 km). In addition, a non-subscription formula makes it possible to pay only per use, without any additional charge compared to purchasing from the operators.
- In **Vienna** and **Hanover** no similar package is offered. In Hanover a single public transport ticket can be purchased via the Mobilitätsshop application. In Vienna, the WienMobil application allows users to buy a more diverse range of public transport tickets and subscriptions, but not the annual subscription.

| | whim Helsinki | WienMobil Vienna | Mobilitätsshop Hanover |
|-------------------------------|-------------------------|----------------------------|----------------------------------|
| Pay-as-you-go | ■ | ■ | ■ |
| Public transport subscription | ■ | ■ | × |
| Package of mobility services | ■ | × | × |




Formulas available via the MaaS application
 ■ Option available × Option unavailable

Setting up a MaaS: what lessons have been learned?

Contrasting governance principles

The examples of Helsinki, Vienna and Hanover show contrasting governance principles. UITP³ identifies three main organizational and governance methods in the MaaS approach, in which the authorities are involved to varying degrees.

- In the **commercial integrator** model, the MaaS operator signs bilateral agreements with the various transport operators. The MaaS is set up in an open competitive framework, with minimal investment by the authorities. This corresponds to the example of Whim in Helsinki, which was developed and is financially supported by the private company MaaS Global, without support from the local authorities.
- In the **open back-end platform** model, the local authority sets up a platform into which data from the various mobility services (timetables, route calculation, booking, ticketing, pricing, etc.) are integrated. MaaS operators then use this platform to build their MaaS solution, allowing competition between different MaaS services. This corresponds to the example of Vienna, where the open public platform was developed by a subsidiary company of two public entities. The MaaS WienMobil service, led by the public transport operator Wiener Linien, is built using this platform, as is the Whim service developed more recently by MaaS Global.
- Finally, in the **transport as the integrator** model, it is the urban transport network operator that develops the service and seeks to attract other mobility service operators to its MaaS solution. This corresponds to the example of Hanover, where Mobilitätsshop is led by the main urban transport operator Üstra and the transport authority. This model also corresponds in part to the example of Vienna, since the MaaS WienMobil offer is operated by Wiener Linien.
- A fourth model may be considered, in which the authority awards a contract to select a MaaS integrator, which may be the transport operator or another company.

| Model | Commercial integrator | Open back-end platform | Transport as the integrator |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Example |  Helsinki |  Vienna |  Hanover |
| Investment by the authorities | Low | Average | High |
| Ability to innovate and provide customer-oriented offers | ✔ Assumed to be high by private MaaS operators | ✔ Left to the initiative of MaaS operators | ✘ Assumed to be more limited by the transport operator |
| Ability to integrate different mobility services | ✔ Assumed to be high | | ✘ Risk of focusing on the transport operator's historical partners |
| Presentation of mobility offers | ✘ Risk of favouring the commercial interests of the MaaS operator | ✔ Possibility of imposing fair and non-discriminatory rules | ✔ Possibility of imposing fair and non-discriminatory rules |
| Contribution to public policy | ✘ Risk of favouring the commercial interests of the MaaS operator | | ✔ Alignment with public policies |
| Customer relationship | ✘ Risk of losing the customer relationship by the local authority | | ✔ Control of customer relations by the local authority |
| Control of data | ✘ Risk of losing control of data for the local authority | ✔ Control of supply data, risk of losing control of usage data | ✔ Control of data by the local authority |
| Competition between MaaS operators | Possible competition between several MaaS operators | Competition facilitated, as part of the investment is paid for by the public authorities. | Monopoly of the authority (except in the case of an offer created by a commercial integrator) |

Analysis of the strengths and weaknesses of the different MaaS governance models

✔ Strength ✔ Opportunity ✘ Threat ✘ Weakness

³ UITP (2019), [Mobility as a service](#), report.

Each of the governance models has its strengths and weaknesses. The commercial integrator model is perceived as the one that allows the most innovation and a better consideration of customers' needs (private operators would be better able to set up mobility packages and develop efficient communication), at the risk of a discrepancy between the objectives pursued by the MaaS operator and public policies. Conversely, the transport as the integrator model will directly contribute to public policy objectives for mobility, but is often perceived as less innovative and less customer-oriented. The intermediate open platform model allows the local authority to guide the actions of MaaS operators, while leaving them the freedom to offer innovative services. While it facilitates the development of MaaS offers led by private operators, this open platform model allows public transport operators to develop their MaaS offer, as is the case in Vienna.

The question of competition or complementarity of the MaaS application with other applications developed by transport operators arises differently depending on the governance model chosen. In Helsinki, Whim and the HSL transport network application offer similar features (route calculation, purchase and validation of single tickets and subscriptions), although only Whim offers packages combining different mobility services such as taxis or car-sharing. In Vienna, the WienMobil MaaS application has replaced the public transport network application and will integrate the few functions whose absence still justified the existence of another application, called Qando.



Advertisements for HSL and Whim applications in Helsinki

The technical facilitators of a MaaS initiative. There are many obstacles to the development of a MaaS, particularly in terms of governance and financing. Beyond the regulatory framework that can create a favourable environment for MaaS, some technical factors may make the development of such services easier:

- **A diversified and efficient mobility system.** This requirement particularly concerns the public transport network, which forms the backbone of the mobility offer accessible via the MaaS application. The existence of integrated fare prices, common ticketing systems and unified information upstream of the MaaS project are all facilitators.
- **Open data and data exchange infrastructure.** The existence of programming interfaces (APIs) for route calculation, booking, ticketing and fare system for the various mobility services, and in particular for public transport, is a prerequisite for the development of MaaS services. The regulatory framework or national or local initiatives that encourage the opening up of transport data may create a favourable context.
- **Open ticketing systems.** Not requiring validation of a ticketing medium to access the public transport network facilitates the development of MaaS services. In Helsinki, Vienna and Hanover, the transport networks are open and ticket inspection is performed only afterwards, by visual inspection or QR-code scanning.
- **Good coverage by the mobile phone network or WiFi.** MaaS services are based on applications that require real-time data transfers between the different entities involved. Reliable mobile internet access is therefore indispensable, and the level of smartphone ownership must be high.
- **Facilitated physical intermodality.** In order to support the digital intermodality provided by the MaaS, physical connections between the different mobility services must be facilitated. This involves the development of interchange hubs and signage.

A challenging economic balance

The question of the economic model is a sensitive issue for the MaaS approach. The response is highly dependent on the governance model chosen.



For **local authorities** (or their transport operators), the implementation of a MaaS service provided by a private operator requires at least opening up the supply data and making them available to the MaaS operator via APIs, which may represent an investment cost and operating expenses. Developing the API for selling tickets, for example, represented an investment of several hundred thousand euros for HSL, the Helsinki transport authority.

Depending on the governance model, the financial contribution of local authorities may be higher if they choose to develop (or have their transport operators develop) an open public platform, or even a MaaS application. However, this public contribution can be justified by the contribution that the MaaS makes to public mobility policies.

For **mobility service operators**, MaaS represents an opportunity to reach new customers and increase the activity of their services. They can also outsource certain charges to the MaaS operator (customer relations, transaction and billing fees, etc.) for services purchased via the MaaS application. In return, the operator can sell its services to the MaaS operator at a reduced rate. This reduction can be passed on to the price paid by the customer via the MaaS application. This is the model chosen for mobility services such as taxis or car rental, in Hanover (where mobility service operators are obliged to offer benefits to customers accessing their services via the Mobilitätsshop application) and in Helsinki.



For the **MaaS operator**, several business models can be considered. In addition to the costs related to the provision and maintenance of its service, the MaaS operator incurs costs related to communication, customer relationship management, transaction fees, etc. To make profits, the MaaS operator can combine several strategies:

- Charge a commission on the sale of services offered by operators;
- Benefit from discounts linked to the volume of mobility services purchased;
- Resell service packages at a higher rate than the cost price.



However, in the absence of public subsidy (the commercial integrator model or, to a lesser extent, the open platform model) economic equilibrium is difficult to achieve. In Helsinki, for example, the transport authority HSL sells tickets for its network to MaaS operators at the same price as the general public rate. As MaaS Global does not wish to resell them at a higher rate, it does not make any margin on the sale of public transport tickets, which nevertheless represent the vast majority of tickets sold via the Whim application. MaaS Global's strategy is to convince its customers to buy mobility service packages, hoping that their actual consumption (paid to transport operators) is lower than the volume purchased (collected by the MaaS operator). MaaS Global also makes profits on the sales of other mobility services.

Case-by-case integration of mobility services

The processes for choosing and integrating new mobility services into MaaS offers vary greatly from one system to another.

- In **Helsinki**, the MaaS Global operator decides whether or not to include a mobility service in its Whim offers, according to its own criteria. MaaS Global takes into account the technical conditions of integration into MaaS (existence of quality open data, openness of the ticketing system, etc.), the relevance of the mobility packages offered, the possibility of entering into an agreement with the operator concerned, etc. Concerning the public transport and bike sharing services set up by local authorities, MaaS Global has simply signed the standardised conditions of use of the APIs proposed by the transport authority HSL. For other mobility services such as taxis or car rentals, MaaS Global signs agreements on a case-by-case basis that define the conditions of access to the service, fare system, etc.
- In **Vienna**, the offers included in the WienMobil package are the result of a historic partnership between the transport network operator Wiener Linien and various partner service operators. However, the range of accessible offers has been reduced due to the withdrawal of a car-sharing operator who wishes to develop its own application. In its future contracts with bike sharing and car-sharing operators, the City of Vienna (which Wiener Linien is answerable to) will require that their services be integrated into the open platform, which will mean that they can be included in the WienMobil offer.
- In **Hanover**, new services are integrated into the Mobilitätsshop offer after discussions between the transport authority GVH and the various transport operators involved in the MaaS offer, who may oppose the arrival of a new operator. For example, the Mobilitätsshop's partner taxi company opposes the integration of car service with driver companies, which it regards as competitors.



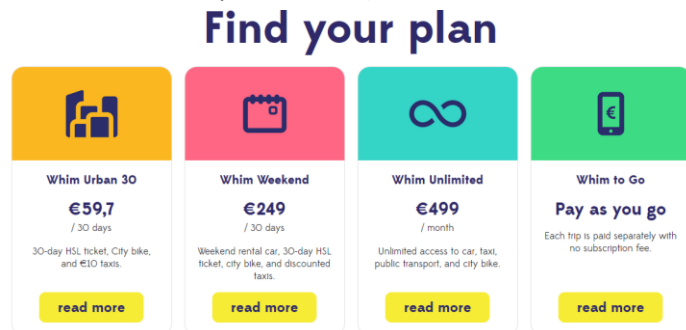
Bus in front of Hanover railway station

Current MaaS services: niche markets

The MaaS offers available in Helsinki, Vienna and Hanover target only a part of the population: mainly working people who are used to using several modes of transport. In Helsinki, the mobility packages offered by Whim, and particularly the Whim Unlimited offer, which starts at €499 per month, are aimed at a minority section of the population. Over year after launching the service, approximately 70,000 people, or 6% of the population of the Helsinki region in which Whim offers are available, had an active Whim account. In Hanover, the Mobilitätsshop application, which only allows users to buy public transport tickets individually, has only a few thousand users.

The MaaS penetration rate is therefore limited for the time being. Several avenues are being considered to democratize the use of MaaS:

- **Make the MaaS application the reference application** for the widest possible range of customers and usages. This is the strategy in **Vienna**, where the WienMobil application is gradually integrating the functions of the other applications for the urban transport network, which it is gradually replacing⁴. The number of WienMobil users is expected to increase, even if most of them will, at least initially, use only some of its features (information, route planner, etc.).
- **Increase the number of offers and service packages**, in order to respond to the largest number of users. This is the strategy of Whim, which already has four different offers in **Helsinki**. However, the multiplication of offers, potentially put in place by different operators, is likely to make the system difficult for passengers to understand.



Various Whim offers in Helsinki

Communication: a key factor. Communication with the general public is of paramount importance at the launch of the MaaS offer, but also in the long term. The concept of MaaS is complex to grasp and may lead to some reluctance on the part of passengers. It is essential to work on the legibility of the offers, detail the content of the packages, and explain how they work step by step in order to get passengers to subscribe to them. This requires suitable communication. The low number of users for some MaaS offers, such as in Hanover, is partly explained by the low level of communication on the subject.

Results to be consolidated in terms of changing mobility practices

Assessments of the effects of MaaS on mobility are few, partly because MaaS systems are still recent and partly because they concern a limited number of passengers. While some initial evidence shows positive effects, it is not possible to say at this time whether the MaaS is able to break travel routines. Further surveys of MaaS service users will be necessary to better understand their mobility practices and to assess a possible modal shift to alternative modes to solo car use. Of the few results of studies on the impact of MaaS systems:

- In Vienna, the assessment of the Smile project⁵, which foreshadowed the WienMobil application, showed a change in mobility practices among users of the Smile application: a reduction in car use for 21% of those surveyed, an increase in the use of urban transport for 26%, train use for 22%, bike sharing for 10%, car-sharing for 4%, an increase in intermodal journeys, etc.
- In Helsinki, assessment of the Whim service⁶ for the year 2018 shows that Whim users make more frequent use of public transport and taxis than the average population, but does not allow conclusions to be drawn regarding possible changes in practices related to subscribing to a Whim offer.

⁴ The recent development of the Whim application in Vienna, however, risks fragmenting the market.

⁵ Smile mobility project (2015), [Results of the Smile pilot](#).

⁶ Ramboll (2019), [Whim impact: insights from the world's first Mobility-as-a-Service \(MaaS\) system](#).

Conclusion and outlook

These examples from Helsinki, Vienna and Hanover show that the MaaS concept covers a variety of achievements, in terms of portage, accessible mobility services or level of integration for the user. Moreover, these experiments are too recent to really evaluate their effects and to confirm their economic models.



WienMobil Station in Vienna

These approaches are largely shaped by local contexts. MaaS applications are primarily deployed in towns where the offer of alternative services to private cars is robust and attractive. The level of integration of pre-existing offers in the area is a determining factor in what is offered via the MaaS. The local context plays on the role of the authorities in the MaaS project: while they are necessarily stakeholders, some of them position themselves directly as MaaS operators, in Vienna and Hanover.

The scalability of MaaS applications is also a recurring point, whether they are initiated through research projects, deployed from pilot versions or developed from previous ticketing and multimodal information systems. In the future, other features might appear: incentive schemes to encourage the use of certain modes of transport, travel guaranteed in the event of unavailability of the proposed mobility offer, interoperable MaaS services from one urban area to another, new packages integrating new services outside the field of mobility, etc.

While the promise of an alternative mobility to the simplified and easily “consumable” private car is attractive, the MaaS has yet to mature and prove itself. One of the main challenges is that these offers contribute to the development of sustainable mobility for all and in all types of area. They effectively support or amplify policies encouraging a modal shift towards alternative modes to solo car use. In France, it is with this objective in mind that the State is seeking to encourage the development of MaaS offers via the provisions of the framework law on mobility on the opening of data and online sales services in particular.

WeChat x MyHelsinki: towards "Life as a Service"? The *MyHelsinki* mini-programme for the WeChat smartphone application is a first move towards integrating urban and mobility services within the same device. This mini-programme was developed in collaboration between the City of Helsinki, MaaS Global and the Chinese company Tencent. It has been available since the summer of 2019, and allows Chinese tourists to access tourist and transport-related information, and to pay for all services (transport, tourist sites, restaurants, etc.).

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