Mobility as a Service

A perspective on MaaS from Europe‘s Transport Authorities

Point of View

EMTA – European Metropolitan Transport Authorities

EMTA

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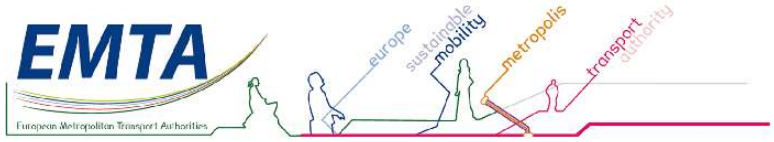
europe sustainable mobility metropolis transport authority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europe
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What's EMTA?

EMTA is the association of European Metropolitan Transport Authorities. It was established in Paris Île de France, where the association officially resides, in April of 1998. Over twenty years after its creation, EMTA now brings together the transport authorities of 27 European metropolitan conurbations. EMTA's member authorities exercise responsibility in planning, integration and financing of public transport and mobility, serving some 85 million Europeans.

The association's founding members (Berlin, Barcelona, Brussels, Frankfurt, London, Madrid, Manchester, Paris and Vienna) opted to position EMTA as a bespoke and exclusive network for sharing know-how, experience on best practices for peer-to-peer exchange and enrichment. EMTA works fully independent from transport operators, SME's and the commercial transport industry and thus allows for very open and honest, yet targeted and detailed discussion among its members.

To continuously enable such discussion, EMTA brings together high-level executives and management personnel of its member authorities twice a year for a general meeting, hosted by a member authority in its respective city or metropolitan area. For further content elaboration, EMTA organizes working groups, collaboration efforts and joint research actions on specific themes and issues, bringing together the respective expert colleagues from the various authorities.

EMTA is governed by a board formed by six elected member authority executives, who for two years extend their competencies in the management of their respective transport authorities with the conception of EMTA's working program. The program defines the priorities and focal topics that will be address in their board period. EMTA's focus topics for the current board period are decarbonization and air quality, MaaS governance, pricing and payment in public transport and data enabled performance benchmarking.

EMTA maintains a small association secretariat where secretary general Ruud van der Ploeg (seconded by Vervoerrregio Amsterdam) and two part-time colleagues coordinate the program actions and administration. EMTA is consortium partner of Horizon2020 research efforts on transport innovation and social inclusion in mobility. Especially in cooperation with other network and representation associations in the field of mobility, like UITP and POLIS, EMTA conducts a lobby towards the European Union institutions on relevant transport and mobility related topics.

Since 2004 EMTA issues its EMTA Barometer, an annual benchmark publication reflecting the state of play in EMTA's member authorities and their respective transport systems.

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Goal of this point of view paper is to further advance the MaaS disccussion by providing a transport authority, and thus public sector perspective. The detailed content of this paper does not necessarily fully reflect the positions of all EMTA member authorities.

How come we talk about MaaS?

Mobility as a Service (MaaS) can be considered as one of the currently most vividly discussed concepts for the future of mobility with entire conferences being organized around it. To understand why EMTA saw the need to actively engage in this debate and launch a collaboration effort on the concept, however, it becomes necessary to take a step back and look into a set of societal changes, their impact on mobility and the way how the MaaS discussion has evolved.

SOCIETAL MEGATRENDS

The advancement in technology of the last decade has directly delivered or induced disruption in a variety of sectors, with the smartphone being the probably single-most significant technology. Increased penetration of smartphones in combination with advancement in communication technology has enabled the development of new products and services, new business models, increased personalisation and extended application possibilities for data analytics. These new opportunities drive the change in behaviour and attitudes, with citizens demanding greater flexibility in the way they work (e.g. part-time, home office days), consume (e.g. streaming or overnight delivery at the doorstep), the way they have social encounters (e.g. social media enabled collaboration). When extending this line of thinking to mobility, it appears only logical that citizens demand for more flexible journey choices, as well.

Large scale urbanization is a recognized phenomenon that increases the pressure on transport networks worldwide. Increasing pressure on the transport networks that enable our mobility is a direct consequence of this popularity of urban centres, with massive congestion and rising levels of pollution being the already visible symptoms. Urbanization changes habits and market structures, requiring investment into more effective infrastructure and more efficient use of existing networks.

Space becomes a scarce resource in agglomerations, making capacity increases to current systems at current locations often difficult and expensive or even impossible in some cases.

Climate change and pollution resulting from vast resource depletion has sparked a trend of growing awareness for environmental protection and sustainability. However, carbon-based transportation is responsible for a quarter of Europe's greenhouse gas emissions and remains one of the largest producers of toxins. Aspects of fuel efficiency and new energy sources but also a need for behaviour change are thus put on the agenda and must be seen as major challenges for the mobility sector.

The aging society, which poses a risk of isolation and lack of access to social amenities for an increasing proportion of citizens, as well as the Millennial generation with its changed value sets must be recognised as phenomena of changing demographics. Millennials are described to attach more importance to access instead of ownership of goods and services. The rise of the collaborative economy, that responds to this access over ownership consumption understanding, is starting change behaviours and attitudes. Young people appear to see less of a need to own a car, drive significantly less and if they drive, they more often use shared or rental vehicles.

These societal developments would each by themselves have a significant impact on our mobility system, yet they are happening in parallel which creates considerable urgency.

DEVELOPMENTS IN MOBILITY

These changes, however, also provide windows of opportunity for the mobility sector and have sparked an active debate and new way of thinking grasped by the notion Smart Mobility. In order to fully comprehend the starting points of Smart Mobility, it becomes necessary to look into the current setup of the mobility system, which may best be described as rigid and mode-based system.

The transport system must be considered to be overall complex. The availability of different transport options varies greatly from one place to another and between different points in time. Furthermore, can the ways in which the range of different transport options are presented to users be quite dissimilar. This complexity leads to a situation where transport choices are habitual and constant. People are used to the transport options they frequently employ but consider it significantly more difficult to undertake a journey with a different mode of transport. This reliance on habits in the choice of transport mode creates several issues.

Through their habitual choices, citizens commit to long-term behaviour. For example, by purchasing transport assets, such as a private automobile or a season subscription for a specific transport provider. Such habitual behaviour is additionally induced through current taxation and subsidization schemes that are solely based on a single mode of transport. This long-term oriented sourcing of mobility creates a lack of flexibility. Users strongly dependent on a single mode of transport for their entire mobility needs and are unable to adapt to disruptions in our infrastructure or changing service patterns. In times of disruptions, the easiest thing to do for travellers stuck in their habitual transport choices is to wait (for example in congestion) and complain.

A transport system that generally bases on long-term commitment to one single mode through the purchase of an expensive transport asset will make it most difficult to encourage citizens to travel more agile and sustainably responsible, as any choice other than the pre-committed mode will likely feel as additional financial burden and may appear as too complex a task for many.

This is where Smart Mobility, and MaaS in particular, set on. Smart Mobility is described as a combination of system thinking, technology and data applied across the transport system to inform decision making and induce behavioural change. It covers a wide range of concepts from the physical integration of different transport modes and inter-modal travel solutions to digitalisation of infrastructure. There is increasing acknowledgement that new ways of organization and public-private cooperation in connection with the application of new technologies can deliver major improvements in terms of integration, capacity and efficiencies. Smart Mobility is thereby expected to reduce the overall cost for transportation and the need for additional infrastructure, as existing infrastructure and vehicles are utilized more efficiently.

GOVERNANCE OF THE SMART MOBILITY TRANSITION

The application of Smart Mobility concepts, such as Mobility as a Service, may provide wide-reaching positive impacts but may also have negative ramifications if managed wrongly. The smart mobility transition describes a paradigm change that may very well be of equivalent reach and significance as the automobility transition, the mass adoption of automobiles in the 20th century, that had changed economy, technology, culture and many other aspects of society. Just like the mass adoption of cars may the smart mobility transition with its new mobility opportunities alter the way we conduct everyday activities, where we want to work, where we want to live and other land-use aspects. This changes the systemic elements of mobility and again reinforces the transition. Recognising these potentially wide-ranging effects of Smart mobility concepts, it becomes for public authorities to fully comprehend these concepts and account for their implications trough effective governance.

Main challenges of smart mobility governance:

Conditions of monopoly

Redistribution of public space to commercial purposes

Data asymmetry

Discrimination through a varying degree of spatial uptake of services

Public authorities currently find themselves confronted with a set of issues that are brought along by the introduction of smart mobility concepts. The long-term effects of these issues and the ways authorities are handling them currently are difficult to identify. These issues include the commercialization of public space through private transport service providers (e.g. car and bike sharing companies). Issues like network effects, where the best provider "takes it all" and develops into a dominant monopolistic scheme. Issues of data asymmetry, where private organizations know more about the mobility system than the regulating authorities. And issues brought along by a varying degree of spatial uptake of smart mobility concepts, which tend to only occur in central city areas, leaving suburban and rural communicates, which often are the areas where a region's transport problem originates, out of scope. These issues are suddenly at the table and demand for new strategic approaches in the governance of mobility.

The transition towards smart mobility requires the rethinking of the role of public authorities. It is necessary to now understand the opportunities but also the potential downsides of smart mobility concepts for the mobility system and its valuable function for society. As Mobility as a Service is considered one of the most promising aspects of smart mobility, it becomes necessary for authorities to understand what effective MaaS governance should look like in order to harness opportunities while controlling potentially harmful impacts.

THE DISTORTED MAAS DISCUSSION

The Mobility as a Service concept has been brought into the centre of attention of the mobility sector by technology start-ups s and consultancy firms. In the recent years, a picture of a bright future of MaaS-based mobility has been drawn, mostly by private sector players, who promised the concept to be the solution for both, urban congestion and rural transport depletion.

The term Mobility as a Service gained popularity and was soon equalized with any sort of servitization fitting the mobility domain and misused for the branding of all kinds of new products and services in mobility. Mobility as a Service can probably be considered the currently most widely discussed and hyped concept in the transport domain. The discussion, however, appears to remain rather producer-led, driven by technology organizations or commercial transport.

While the common tenor in the discussion of MaaS is around societal goals of sustainable transport, congestion prevention and even public health, it would be naïve to consider the producer interest of an industry that accounts for 5% of Europe's GDP as inevitably aligned with the wider, far more complex needs of society as a whole.

This unfortunately rather one-sided discussion of the concept has caused confusion around what MaaS actually is and has led to rather unrealistic expectations amongst experts, the general public and politicians. These somewhat ill-informed expectations range from a described potential of MaaS to replace inefficient public transport lines in rural areas to the potential of the concept to in itself solve challenges connected to negative externalities of car-based transport, like congestion, space occupation, emissions, etc. It is mainly the commercial stakeholders of the mobility system and new entrant organizations that put forward their ideas to the development of the concept and its impact on mobility and society. As the interests of these organizations may not naturally contribute to cities and region's mobility challenges and development objectives, a detailed elaboration of the MaaS concept from a public authority perspective and a stronger involvement of public organisations in the discussion around the market structure of MaaS is inevitable.

Through the launch of its collaboration effort on Mobility as a Service, EMTA wishes to contribute to this need for more public sector perspective by elaborating with its member authorities on sustainable MaaS market setup and effective governance under consideration of the described societal urgencies and potential issues.

What is MaaS?

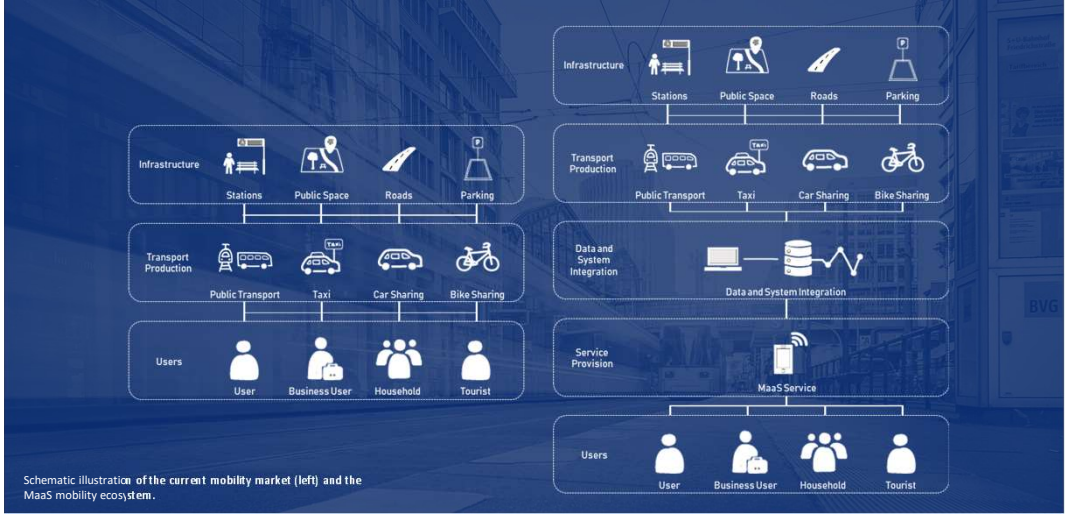
Despite an ever-increasing amount of initiatives and pilots engaging with the concept, much unambiguity remains around notion of Mobility as a Service and its defining aspects. A common comprehensive definition appears to not yet be agreed on. The term MaaS has in the recent past been used to denote a wider vision for shared mobility, so the shared use of cars, bikes and other transport assets. Others used it more liberally to describe any sort of new transport related product or service (e.g. route-planning app). It is even argued that the novel, promising character and increasing popularity of the term Mobility as a Service has led to conscious misinterpretation. Such misinterpretation can also be found in the academic domain and can be considered as one of the reasons for the distorted discussion of the concept, which harms the further development of the actual underlying idea.

While the inconclusive discussion around MaaS, as a container term for anything seemingly new in the transport sector, has only produced confusion and unrealistic expectations, the actual idea the term intended to describe must be considered to have evolved into a tangible concept. From what we know from evidence today, MaaS is merely a concept for the integration of all existing, public and commercial modes of transport and does not create transport capacity by itself. Existing expectations that MaaS has the potential to replace inefficient public transport services, especially in more rural areas, must be considered unrealistic as the MaaS service only integrates what is there already.

Mobility as a Service may be a solution for citizens to source and manage their total mobility and travel demands through one unified service. Customers are enabled to choose their transport option based on their respective general preferences but also under consideration of needs that may be specific to a certain journey, for example the need to transport larger items. The service thereby integrates all various transport modes. On the one hand, this means it allows users to compare mode options with one another for a specific route. On the other hand, this integration facilitates multimodal journeys, where several different modes of transport are used consecutively in a multimodal chain to travel from door-to-door, in an easy way. To compile such multimodal journeys in a pleasant, easy and integrated manner, the service will have to fulfil several functions that become necessary at various stages of the multimodal journey.

To grasp this current understanding of the concept and to ensure everybody in the EMTA network has a similar understanding of the term MaaS to enable a detailed and successful discussion, EMTA proposed the following definition of the concept as working definition. This MaaS definition seeks to reflect both the general enabling aspects of the service and the service components necessary to enable true multimodal possibilities. It furthermore directly expresses the generation of insights for cities and authorities as necessary component of MaaS, as EMTA believes that it is informed system and policy adjustments which base on such data generated insights that may, in fact, render the greatest societal benefits.

With Mobility as a Service (MaaS), customers fulfil and manage all their mobility needs on demand, based on their general preferences and journey-specific needs. The service is based on the seamless integration of all different public and commercial modes of transport and is delivered via a digital interface. The service must enable multimodal travel possibilities and thus allow for the planning and booking of multimodal journeys, support on the go and payment as well as alteration of the planned journey. MaaS also generates insights into demand, needs and travel behaviour for cities and authorities, allowing for more targeted and effective adaptations of services and investments in infrastructure.



Schematic illustration of the current mobility market (left) and the MaaS mobility ecosystem.

THE MAAS ECOSYSTEM

When looking at the current set-up of the mobility system, it may be best be described as a system of detached system, with the various transport modes existing more or less in parallel. Each provider thereby maintains its respective value chains to its customers, which are detached from the value chains that other providers retain to the same and other end-users. To enable Mobility as a Service, two additional aspects will need to be added to facilitate the ecosystem approach the concept describes: Data and Systems Integration and Service Provision. This creates a value chain system with the five functions Infrastructure, Transport Supply, Data and Systems Integration, Service Provision and Users. Each aspect fulfils a certain role in the creation and consumption of a multimodal mobility service. The various public and private stakeholders that fulfil these functions together form the MaaS ecosystem.

Mobility as a Service is described as user centric concept. The end users, who source their mobility through MaaS must thus be considered as baseline of the MaaS ecosystem. Dependent on the market set-up, different user groups with different needs and preferences (e.g. individuals, business travellers, households, etc.) may be attracted to different MaaS service providers who may differentiate their offerings according to such market segmentation. The service offer that users consume is composed by a service provider and delivered through a digital interface, e.g. a smartphone application. This service thereby needs to considerer at least all service aspects necessary to enable multimodal journeys but may very well be enhanced with other services, such as calendar integration, weather forecasting and loyalty programs.

To compose the MaaS service and provide for multimodal journeys, the service provider needs access to all service relevant data and business logics of the various modes of transport. Relevant data concerns, amongst others, locations of public transport stations, routing and timetable information, real-time location of trains, busses, shared-cars and bikes, location and pricing information of ride-hailing services and the respective booking and payment systems of the various modes. The necessary access to these data and logics can be organised in a variety of ways dependent on the nature of the employed technology and level of envisioned standardization and openness in the ecosystem. This report elaborates on various of these set-up scenarios later on. Mobility as a Service makes use of a variety or even the entity of transport services available in a city or region. The transport supply is hence the fourth operational aspect of MaaS, comprising these various public and commercial operators who supply assets that users can drive or ride themselves (e.g. car-sharing vehicles, bikes, scooters, etc.) and service capacity (e.g. public transport, taxis, etc.) On its own, this level resembles the transport solutions operating disconnected from one-another, analogue to the way these modes currently operate in many cities already.

Both public and commercial transport services make use of public infrastructure. The basic infrastructures such as streets, parking spots, bus stops, rail and metro lines as well as stations, bicycle parking zones and side-walks are thus the fifth aspect of the MaaS ecosystem. Access to public infrastructure defines whether a certain transport service, and thus the basis for multimodality, can occur or not.

What could be the impact of MaaS?

As described previously, our current mobility system must be describes as rather rigid and complex, with several mode-based systems running somewhat parallelly to one another. Mobility is characterized by habitual behaviour with citizens committing to transport modes through encouraged long-term purchase behaviour, which creates tremendous inflexibility in their travel behaviour and makes it significantly difficult to encourage more sustainable mobility. It is this lack of flexibility, the missing ability to adapt to change and disruptions as well as the recognized awareness for a necessary shift towards more sustainable options that are the windows of opportunity for MaaS.

The integration of all existing transport services, which is the underlying thought of MaaS, may succeed in getting users to their destinations in a much more adaptive and flexible manner. Customer demand can be matched with the total transport system's capacity and performance in real time to enable the calculation of optimised travel options. Through this intelligent matching, more efficient use of existing infrastructure and capacity can be achieved, while reducing negative externalities of transportation, such as congestion and unnecessary vehicle emissions. Thereby, a user's general preferences concerning travel aspects like speed, convenience, comfort and cost, but also journey specific needs, for example a need to take along large pieces of luggage, a child buggy or the need for step-free access, can be taken into account.

Users are offered the opportunity to choose for each journey the transport product and combination of transport products, that best matches their requirements for each specific journey in an easy manner. Citizens will, thus, come to enjoy a transport system that increasingly supports their lifestyle requirements. The reduction of habitual purchase behaviour in mobility will make the actual cost of mobility more transparent and might allow for cost saving possibilities for citizens. The mobility necessary to participate in society becomes less dependent on ownership of often expensive transport assets, which improves social inclusion, reduces isolation and improves access to amenities such as health and education, employment, culture and other social institutions for everybody.

For cities and regions, this reduction in long-term oriented sourcing of mobility may provide as possibility for more dynamic prizing of infrastructure and services, which may enable a spread of travel demand away from peak times, reducing the need for additional infrastructure. Public authorities, transport operators and policymakers will furthermore become able to improve products, services and infrastructure in a more targeted and effective manner as a result of improved insights regarding mobility demand, distribution of travellers over time, location and transport modes, as well as a better understanding of traveller needs. Increasing availability of integrated transport data at the journey level allow for new service and infrastructures to be developed where they are most effective for the transport system as whole, rather than advancing a single transport mode as has been the historic approach. Public investments can, thus, become more efficient and useful for everybody.

To summarize, based on the general benefits of MaaS, as they are presented in the literature and by various transport sector players, EMTA expects MaaS to contribute to the accessibility of cities and regions, the development of a more sustainable transport system and the vitality of metropolitan areas. It is important to note, that MaaS will not deliver these benefits on its own. To allow for the envision impact, MaaS will need to be accompanied by investments in infrastructure for slow means and public transport, more adequate management of street space and parking to allow for car traffic diffusion, and a revision of fiscal and subsidy regulation to internalize negative transport externalities in the face cost of a mode of transport. Nevertheless, MaaS – the facilitation of multimodal mobility, should be considered as an important level in this entity of tools and programs necessary to reach local policy goals and as a sector deliver our important contribution to the general sustainable societal development goals.

HOW REALISTIC ARE THESE BENEFITS?

The potential positive impact ground on the expectation that MaaS empowers citizens and visitors to make the most optimal choice of transport mode for each journey, which relieves a regions transport networks, induces more sustainable travel and reduces the amount of space necessary for mobility. These expected contributions are assumptions! Whether these assumptions are true, both in terms of significance and impact, remains unclear to date as empirical evidence around the effects of MaaS is inconclusive and very limited.

There is some evidence from field operational trials in Gothenburg and Vienna and an operational commercial service in Helsinki. These limited insights suggest that MaaS can induce the expected behavioural change. However, it is important to note that the trials were conducted in test conditions and that both trials and operational service are covering only a small sample of the population of these cities, which may not necessarily be representative. Despite these limited insights, the actual impact of larger scale application of Mobility as a Service under normal market conditions remains fully unknown to date!

Criticism of the concept often evolves around the concept of the MaaS ladder of transport mode shift, which describes that the reduction of barriers, which currently prevent a certain mode choice for users, may induce an unfavourable mode shift. A substitution of walking and cycling trips with public transport as well as a shift from public transport to car-sharing, taxi or taxi-like services, thus towards car-based modes, must be considered unfavourable from the perspective of the city and society at large. A certain degree of an unfavourable shift , e.g. from public transport to car-based services, can be seen as evidence for the intended flexibilization of mobility in which users choose their mode of transport based on their journey specific needs. However, in order to fill its promises and offset these unfavourable shifts, MaaS will have to deliver a significant shift away from private car use to multimodality. Otherwise, any shift away from public transport must indeed be considered as negative development.

Insights from Gothenburg

In a large-scale MaaS trial in Gothenburg in 2014, where 70 households had access to a MaaS service, 97% of the participants indicated that they wanted to continue using the service after the trial period. 93% of them also said that they would recommend the service to friends and family. Trial participants were found to make considerably more use of carpool services, as evidenced by the increase of around 200%. The use of public transport also increased considerably. Among the participants who owned a private car during the test, their use fell by 50%. At the end of the trial, 97% of users who had experienced changes in their travel behaviour stated that they were satisfied with these changes in their use of the mobility system.

Insights from Vienna

In the pilot of a multimodal mobility services organized in Vienna by the city utility company and its transport operator in 2015, 75% of the participants in the evaluation survey (117 out of 1000 test participants) stated that they were very satisfied with the service. The service was mainly used privately (64%) and for recreational mobility needs (59%). When making a trip where the usual mode of transportation was not available, 45% of the participants used the service to plan and execute their trip. 48% of the participants generally used more public transport, 10% increased the use of bike share and 4% increased the use of car sharing. A decrease in the use of a private car was indicated by 21% of the participants.

Insights from Helsinki

In the fully operational, commercial MaaS service, which has now been operating in Helsinki for about a year, 95% of all journeys via the service were based on public transport, suggesting that public transport is the backbone of the MaaS offering. The first insights from the Helsinki service also suggest that users show more multimodal travel behavior during their journeys, integrate three times more taxi and public transport than the Helsinki average and make intensive use of bike sharing before or after a public transport journey. However, the data also suggest that users of the service more often replace cycling and walking with public transport and taxi rides. The use of the taxi in general is 2.4 times as high as the average in Helsinki. The insights further suggest that there is no difference in the number of car journeys per day between MaaS users and non-MaaS users.

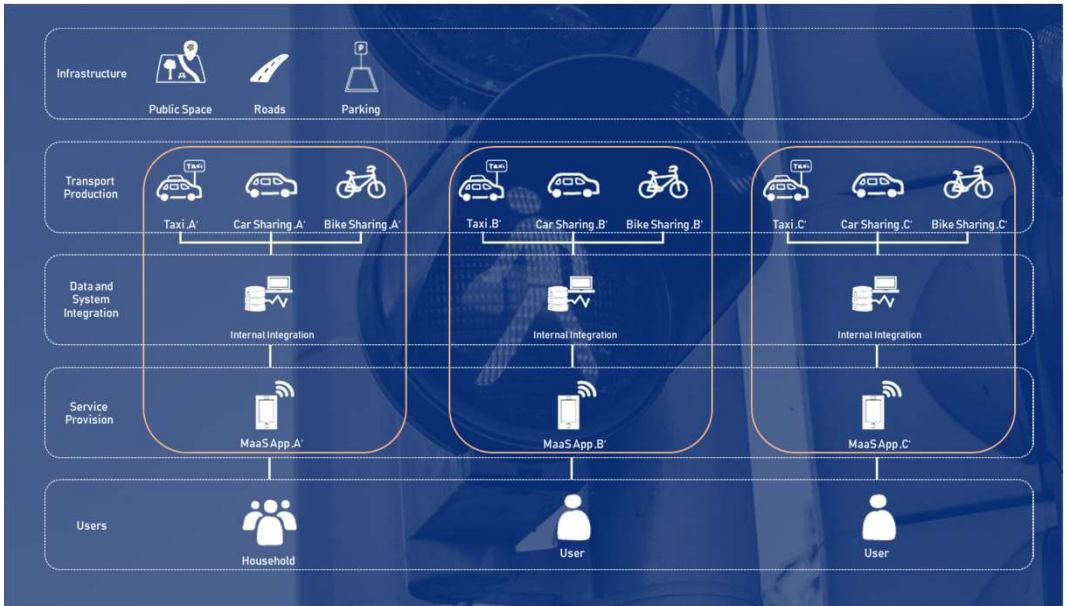
How can MaaS be put together?

As introduced previously, MaaS introduces two new organisational aspects, Data and Systems Integration and Service Provision, that are not present in the current transport system in which transport solutions operate disconnected from one another. These two new roles can either be allocated to existing players that are already present in the current transport system or spur new players to emerge. A distribution of these two organisational aspects amongst public and commercial, incumbent and new entrant organizations to the MaaS ecosystem allows the differentiation of five major potential set-up scenarios for Mobility as a Service. The following introduces the particularities of these scenario's and sketches potential advantages and disadvantages of these scenarios from the perspective of a metropolitan transport authority.

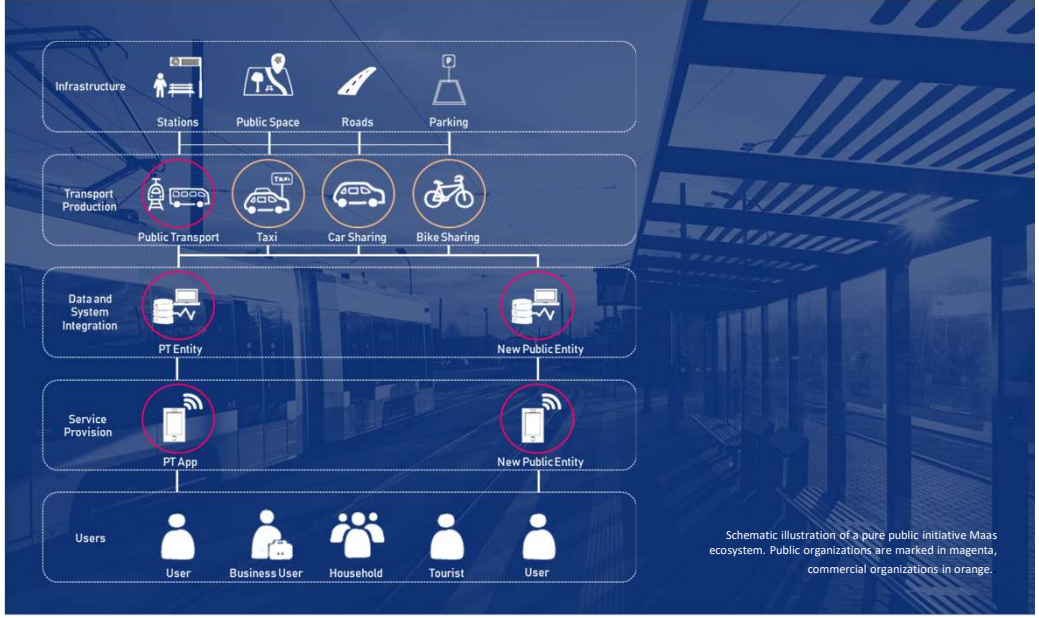
ECOSYSTEM COMPETITION

The ecosystem competition scenario is characterized by several, mutually exclusive, vertically integrated mobility ecosystems that compete with their respective own transport assets and their integrated mobility application. While this market scenario promises high levels of service and certain uniformity for the ecosystem's own services, it likely excludes any other service, increasing entry barriers on the transport market and vendor lock-in effects for customers. Network effects may apply and lead to the creation of dominant, monopolistic market parties.

While the ecosystem organizations may be very interested in integrating public transport options, their purely commercial business case may the steering of users to own transport services where profits can be made rather than enabling fair competition of modes that provides customer choice. The most significant problem for cities, however, is the expected mutual exclusivity of the transport modes of each ecosystem as there is simply not enough space in our cities.



Schematic illustration of an ecosystem competition based MaaS market. Commercial organizations are marked in orange.



Schematic illustration of a pure public initiative Maas ecosystem. Public organizations are marked in magenta, commercial organizations in orange.

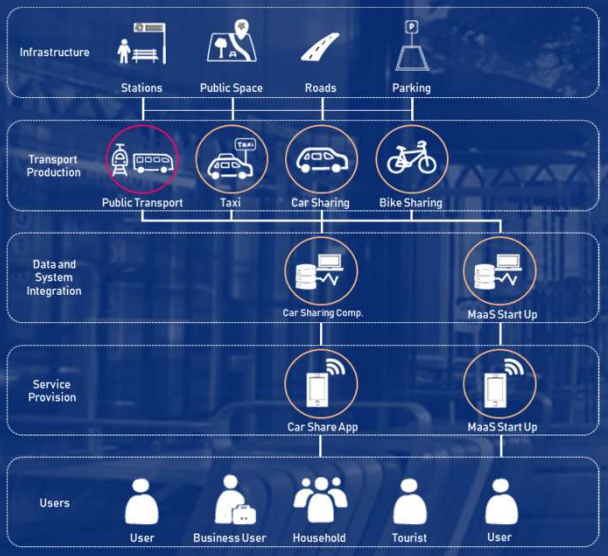
PURE PUBLIC INITIATIVE

The Pure Public Initiative scenario describes a MaaS development that is induced and controlled by a public party, for example a transport authority, an in-house transport operator or a newly established public entity, which takes on both the Data and Systems integration and Service Provision roles. The MaaS service could either be developed and operated entirely by the public domain or be awarded or licensed to a private organization for a certain time period.

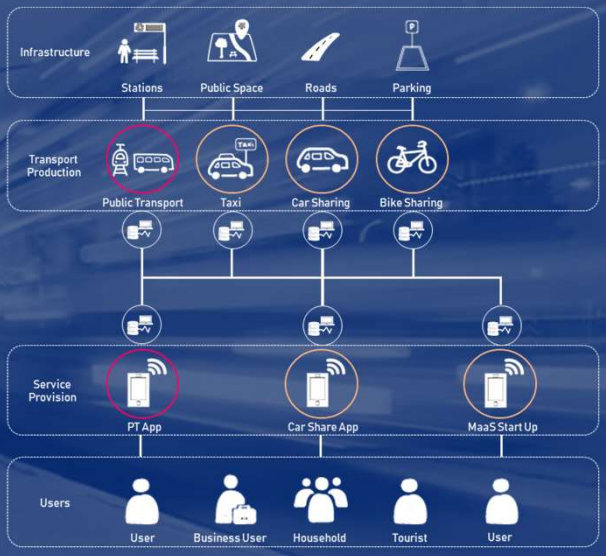
The Public Initiative scenario bases on some form of a public monopoly. The close organizational or contractual relation between this public MaaS entity and the authorities can be considered as advantage of this option, as it may allow for uncomplicated regulation and the protection of public value. Governments' and authorities' access to relevant data to generate valuable insights for policy making and infrastructure adjustments is assured. The close connection between a public MaaS provision and public transport potentially allows a fast reach of the vast customer base of public transport.

The public monopoly on MaaS provision, however, poses substantial limits on the number of service providers citizens can choose from. A 'one approach fits all' MaaS offering developed by the public domain may, however, not align with needs and preferences of citizens that are not currently users of public transport. The public monopoly idea this scenario bases on is likely enforceable only by restricting the integration of public transport exclusively to the public MaaS entity. Private actors may in response create MaaS services without integration of public transport: A car sharing provider could, for example, integrate ride-hailing, car-rental, and cycle hire options into a MaaS scheme, which would generate a private sector competitive product to the Public MaaS entity based on mostly car-based transport modes. Customers of this private competitive product would be unreachable for public transport.

A public MaaS entity may likely provide its services only within its authority's jurisdiction, creating a lack of geographical scalability. Mobility, however, does not stop at the border of the city or region. Furthermore, it remains questionable whether the development of a pure public initiative MaaS market is in line with European competitive law and does not surpasses the legal capacity of authorities.



Schematic illustration of a (decentral) commercial initiative MaaS ecosystem. Public organizations are marked in magenta, commercial organizations in orange.



Schematic illustration of a standardized ecosystem MaaS market. Public organizations are marked in magenta, commercial organizations in orange.

(DECENTRAL) COMMERCIAL INITIATIVE

The (Decentralized) Commercial Initiative Scenario describes the development of MaaS services by commercial market parties in an open competition, be that incumbent transport service providers (e.g. car-sharing providers) or new entrants. The role of the public domain is mainly the facilitation of the market by ensuring access to relevant transport data and system logics (e.g. reservation and ticketing), additionally to its traditional role of infrastructure and public transport provision.

There is no creation or perseverance of a public monopoly position and the issues of location and capacity scalability are reduced due to the non-location bound nature of private organizations. The open market may allow for a variety of differentiated offerings to be created, which may target different market segments, potentially leading to better choice possibilities for users. The less location-bound nature of commercial organizations allows for geographical scalability.

Commercial MaaS provision may, however, lead to developments that risk reducing the alignment of MaaS impact and societal policy goals: For-profit MaaS providers may seek to optimize their business cases through steering users towards transport modes and services where margins are highest. This are likely shared mobility and taxi-like services, considering that public transport leaves few room for intermediary margins. Commercial MaaS providers may furthermore seek to engage in somewhat exclusive partnerships with transport service providers to protect market share in the competitive environment. As described previously in the Ecosystem Competition market scenario, transport infrastructure in urban areas is likely not able to accommodate several MaaS schemes with each having different, mutually exclusive TSP partners to produce transport capacity on the road.

Market entry barriers can be considered substantial in this scenario when recognising the need for contract negotiations with each Transport Service Provider (TSP) and the data and integration capabilities necessary to compile a MaaS service. Exclusive partnerships between TSPs and MaaS providers likely additionally increase entry barriers, further advantaging large, tech-savvy and capital rich organizations. Market dominance and high entry barriers may become an issue for society as network effects, a phenomenon common to the digital platform economy, likely apply in the context of MaaS: The MaaS scheme with the largest customer base may likely becomes the one that transport capacity producers will want to be engaged with, which in turn increases its attractiveness towards customers. In consequence this can lead to strong private monopolistic positions and the risk that “the winner takes it all”, which may also harm the access to customers for new transport services, leading to reduced development.

While effective regulation and governance may very well control for such developments, authorities and local governments must be considered widely disconnected from these commercial MaaS developments. Data generally remains in the commercial domain, leading to difficulties when the access of data is concerned that could provide necessary insights for informed policy, regulation and effective infrastructure developments.

STANDARDIZED ECOSYSTEM

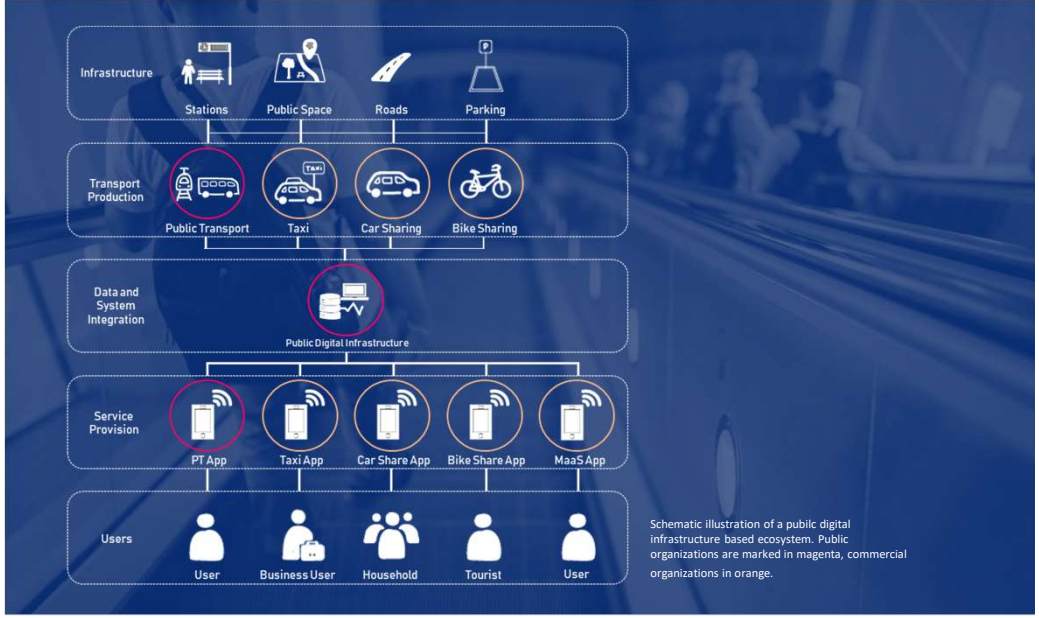
The standardized ecosystem scenario bases on the standardization of technology to allow public and commercial MaaS entities to access data and systems of transport service providers for the creation of integrated services. Goal of such technological standardization would be the creation of a non-discriminatory level playing field for MaaS services that enables any organization to access all relevant systems easily with reduced need for adjusting technology between different transport service providers. The technology would need to enable public authorities to access certain data sets at both the side of transport service providers and MaaS providers, to assure that data which provides necessary insights for informed policy, regulation and effective infrastructure developments is available to the respective public authorities.

The technology standardization makes service relevant data of each TSP generally accessible in a standard manner but does not integrate this data. Some form of integration remains necessary and at the side of the MaaS providers that would need to integrate the data and system logics sourced from the various TSP themselves to provide a MaaS service. It depends on the chosen technology, whether the system allows for standardized contractual agreements and transactional clearing or whether each MaaS provider would need to engage in agreements with each single TSP. Some technological solutions may furthermore still require some form of centrality, for example in terms of a central directory listing with the attributes of all connected entities.

Standardization is widely considered a practice spurred by the need of an industry to create more effective processes that all industry stakeholders benefit from, which explains the stakeholders’ engagement in the standardization effort. It remains unclear whether all stakeholders of the MaaS ecosystem, TSPs, MaaS providers and authorities, see an urgency large enough to engage in a standardization effort.. Standardization may pose a risk of regulatory capture, as changes to the system might again require agreement of all stakeholders. This could create disadvantages for players that enter into the system at a later point in time, as already engaged stakeholders could prevent changes to the system to keep out competition and protect their market share.

The discussion around technology standardization in MaaS is currently mostly driven by two types of actors: Public sector entities, who seek to facilitate MaaS through forcing publicly induced technology standards on all ecosystem stakeholders. And technology enthusiast or tech-organizations that seek to promote their technology solutions. Potential technological solutions mentioned in the discussion are, amongst others, standard APIs in connection with standard communication and transaction protocols, and distributed ledger technology (the blockchain), that would both reduce the need for centrality.

It remains questionable whether all stakeholders of the MaaS ecosystem are willing to implement standardized technology that allows third parties and public entities access to potentially commercially interesting data. The MaaS concept and the new mobility market in general, must be considered a rather young phenomenon. Not only authorities but transport service providers as well are trying to make sense of these developments regarding their business models, interests and strategies. The great uncertainty about the concepts' impact and the need of all stakeholders to find their preferred role within this new ecosystem, may provide ground for organizational scepticism and a need for controlled MaaS development. These vested and diverse interests of actors, at least currently, thus appear contradictory to a standardized ecosystem approach.



Schematic illustration of a pubilc digital infrastructure based ecosystem. Public organizations are marked in magenta, commercial organizations in orange.

PUBLIC DIGITAL INFRASTRUCTURE FOR OPEN MAAS MARKET

The Public infrastructure for open market scenario bases on the separation of the two newly introduced roles in the MaaS ecosystem. The public domain takes on the Data and System Integration role, providing a public digital infrastructure that enables commercial and (semi)public organizations to compile services (Service Provision role). This scenario stems from the understanding that infrastructure that enables societal and economic activity is a public sector duty to ensure fair, sustainable and public value development. As mobility becomes smarter and utilizes digital means to better align with society's needs, these digital means could be considered a form of infrastructure as well, analogue to roads and stations, which makes its development and maintenance a public sector duty in order to ensure fair, sustainable and public value conduct, also in the digital space.

Public and commercial, incumbent and new entrant organizations are granted rule based but generally open, non-discriminatory access to integrated data and systems (e.g. ticketing, reservations, etc.) via the public digital infrastructure. This results in low entry barriers which allows a variety of services to compete based on differentiation of their services and brands capability rather than on exclusivity, data and systems ownership ad market capitalization, reducing the risk of private monopolies. The open access allows both local, interregional and international service providers to enter the market, which addresses the issues of scalability of the service beyond the jurisdiction borders of local authorities to meet user's total mobility demands. The various services thereby target different customer segments, making MaaS potentially interesting to any kind of traveller.

The public-private development is expected to reduce risks for all stakeholders as the organization allocated with the facilitation of the Data Integration role is likely a trustworthy public entity, which provides for a neutral buffer between the transport service industry and MaaS service providers. The facilitation of the Data Integration through a public entity furthermore ensures the public sector's access to data and insights relevant to regulation, policy making and infrastructure adjustments.

The public digital infrastructure enables both authorities and stakeholders of the transport system to find out what MaaS does in regard to their strategic goals and business models, in a low-risk and controllable manner that allows for adjustments should the MaaS ecosystem develop in unforeseen and publicly unsound directions.

The development of such public digital infrastructure by public domain organizations themselves may risk becoming a slow and bureaucratic process. Cooperation of the public with technology organizations to develop such systems therefore seems inevitable for the system to also after its introduction remain agile enough to keep up with the fast pace of technological advancement.

A sustainable 'public value' MaaS ecosystem

This chapter seeks to outline the functionalities of the MaaS ecosystem as envisioned by EMTA. This point of view to the development of MaaS bases on our current understanding of the concept and has been elaborated in the EMTA collaboration process on Mobility as a Service, particularly during a two-day focused discussion seminar held in Birmingham in March 2019. The following first chapter introduces a set of general functionalities. From the perspective of metropolitan transport authorities, these define a sustainable MaaS ecosystem that creates public value for society and can contribute its part to meeting our region's and city's mobility challenges. Secondly, the ideas for the more detailed particularities of a sustainable public value MaaS ecosystem are outlined based on the five organizational dimensions of MaaS.

GENERAL FUNCTIONALITIES

A sustainable 'public value' Maas ecosystem needs to enable an open and inclusive two-sided mobility market. It can support innovation and facilitates the entry of new services and players, both at the side of the transport production and the service delivery towards customers. While there is a need for certain minimum requirements to take part in the system, such as the control for solvency of service providers, lawful conduct, etc., participation in the eco-system should generally be possible for any kind of actor on a non-discriminatory basis. Practices that hamper fair competition or induce deficiencies for cities and citizens need to be controlled for by authorities, who will need to be able to do so in an effective manner. The ecosystem needs to be inclusive in a sense that all transport services and publicly accessible transport assets offered in a region are part of this ecosystem and that new services become immediately part of the ecosystem when starting operation. All transport modes need to become available for integration to start creating a multimodal reality in our metropolitan areas, no matter how large or small the service or fleet.

A sustainable 'public value' MaaS ecosystem needs to create a citizen centric mobility system, enabling well informed mobility choices that align with what is best for citizens and the city. It needs to reduce any mode dependencies of citizens and facilitate more agile and journey-specific need-based mobility. This needs to be reached by allowing citizens to make their own, well informed choice based on real-time transport network performance and comparison of real costs. The ecosystem needs to be resilient in a way that it can adjust itself quickly to make it work for citizens and give them the reliability to always be able to move around, even if providers stop their service unexpectedly.

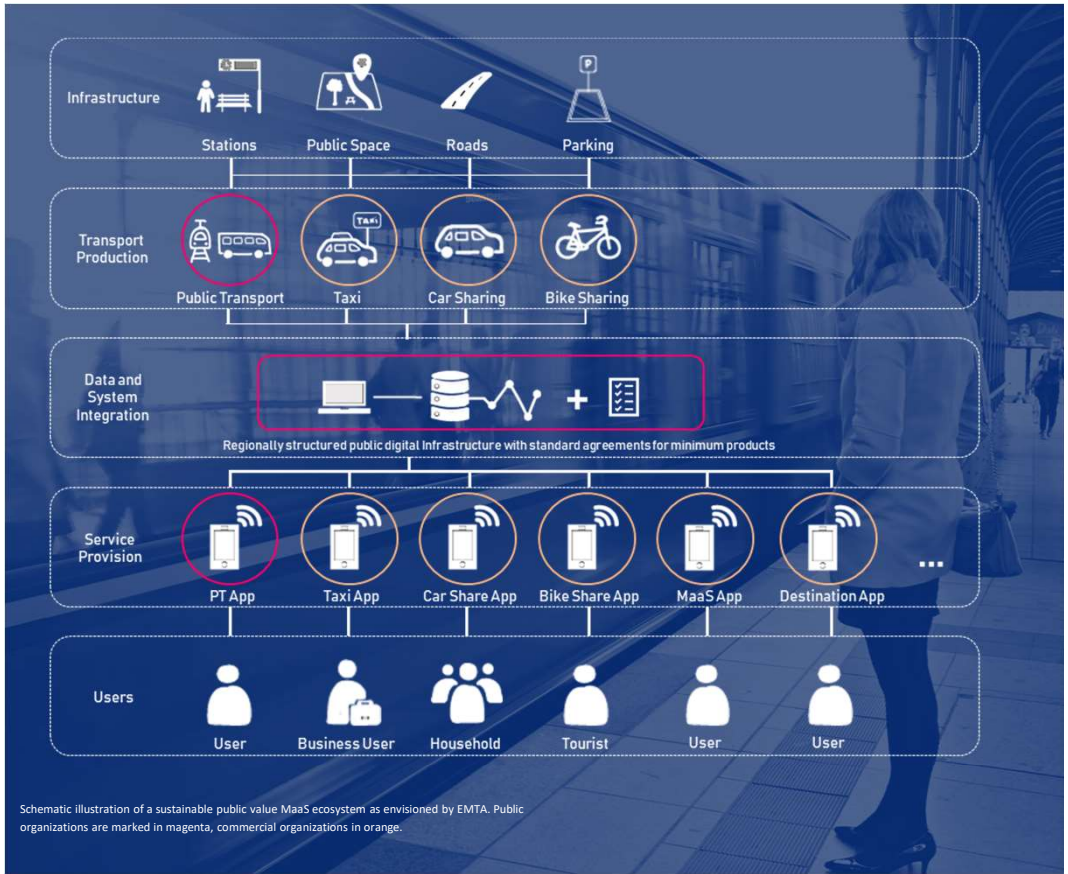
A sustainable 'public value' MaaS ecosystem contributes to the reduction of negative transport externalities. Multimodal travel enabled by the ecosystem needs to support the shift away from car use and car dependencies and enable the effective use of infrastructure and seat kilometres. By aligning mode choice better to the journey specific needs, a true multimodal reality may induce a societally negative modal shift for a certain amount of journeys. This negative mode shift needs to be clearly offset with societally desirable mode shift behaviour. The ecosystem, thus, needs to reduce overall vehicle miles travelled and strictly control for empty vehicle miles produced.

A sustainable 'public value' MaaS ecosystem needs to be regionally structured to align with local context conditions while being internationally accessible to enable full mobility. Smart mobility mostly addresses urban and metropolitan problems. And while Europe's metropolitan areas may suffer from a very similar set of problems, the local contexts remain rather dissimilar which makes it necessary to enable the development of regional systems that work for the regions, their cities and citizens and addresses their local needs. It is municipalities and transport authorities that are in charge of the creation of mobility policy and its achievement through the right governance of the system.

The MaaS ecosystem needs to support these policies and will need to be adjustable for cities and region's if the system does not contribute to or even harms these policy goals. The multimodal reality created by the Maas ecosystem may require adjustments in infrastructure to accommodate and well serve the intended modal shift. The infrastructure that likely require profound adjustments are regional public transport and urban streets, which fall in the jurisdiction of regional and local authorities. To allow for such profound adjustments to be most effective, it is thus regional and local authorities that need access to certain data generated in the ecosystem to create valuable insights for policy making, effective infrastructure adjustments and the overall governance of the ecosystem to control for its impact. The regionally structured ecosystems, however, need to be openly accessible and enable actors from anywhere to integrate the transport modes and assets in the region into their supra-regional or even international multimodal service provision.

USER LEVEL

The potentially far-reaching positive impact of multimodality can only become a reality if the MaaS concept succeeds in making more flexible modality choices and multimodal travel behaviour available to a wider public. The system does not simply need to further ameliorate travel for those in public transport but will have to attract citizens that do not yet utilize multimodal mobility and enable them to do so in a for them convincing manner. The long-term objective for the User level therefore needs to be the facilitation of multimodal travel for every type of travel motive and for the entire variety of customer segments (business travellers, students, commuters, families, tourists, etc.).



Schematic illustration of a sustainable public value MaaS ecosystem as envisioned by EMTA. Public organizations are marked in magenta, commercial organizations in orange.

MAAS PROVISION LEVEL

To facilitate multimodality for any type of travel motive and the full variety of segments of citizens and visitors, a variety of services with differentiated offers, focusing on different customer segments, appears pivotal. To achieve such service variety, it must be generally possible to compile MaaS offers for an kind of organization. Both public entities (e.g. transport authorities), semi-public organizations (e.g. inhouse public transport operators) and private public transport operators should be able to put together a MaaS service, if they desire to take on this role in addition to their role in producing public transport. To enable supra-regional or even international coverage of such generally location bound, public transport sector induced MaaS services, transport authorities could engage in roaming procedures, handing clients travelling in another regions over to the authority service of the respective region, analogue to the roaming system employed in telecommunication.

The same applies to commercial transport service providers and operators of publicly accessible transport assets: Providers of car-sharing vehicles and shared bikes or taxi companies should be enabled to compile multimodal services and market these to customers in addition to their traditional service production. Also, external or third-party organizations, that are not present in the transport system with own services or assets, should in the same way be able to provide MaaS services. EMTA envisions not only large, tech savvy organization with high market capitalization to be able to offer such services. Start-ups and smaller organizations in the transport sector (for example taxi organizations) should also be enabled to provide such services in general. This open and facilitating approach to the provision of multimodal mobility services should also allow large traffic-inducing organizations and destinations, for example airports, fair and exhibition grounds, sports arenas and concert halls, as well as large shopping and recreation destinations, to easily provide multimodal transport solutions to their customers via their own channels. Business logics and algorithms, for example for the routing of a trip or the calculation of the most suitable combination of modes, employed by MaaS providers should be transparent.

Regardless of what organization or entity complies the Maas offer, any service should provide a certain minimum features to enable true multimodal journeys.

This includes multimodal route planning, the possibility to undertake the journey, thus access to necessary reservations and tickets, a form of guidance along the way and alteration possibilities in case of disruptions, finalized withuniform payment for the journey. Additional service features that exceed these basic aspects of a multimodal journey should not be restricted whatsoever, as these provide ground for differentiation of services which makes multimodality more interesting to a wider public. Think here of loyalty programs of commercial providers or soft nudging programs of public providers.

DATA AND SYSTEMS INTEGRATION LEVEL

The Data and Systems Integration needs to allow for this open and facilitating MaaS market approach while taking into account regional context and policy condition. It needs to ensure that local and regional authorities have access to data that can generate necessary insights for policy making, infrastructure adjustments and the governance of the various ecosystem functions themselves.

EMTA considers the creation of public digital infrastructure at the regional or metropolitan level as most suitable approach for the creation of a sustainable ‘public value’ MaaS ecosystem that works for cities and allows the transport production and service delivery industry to thrive in the fair competition of an enabling market setting.

The public digital infrastructure is to create a level playing field for MaaS services by making the service-relevant data and systems of all transport providers generally accessible via one system. This system must make every form of contractual agreement between transport service providers and MaaS providers technically possible, enabling multimodal transactions. It should act as trusted approval institution and trusted facilitator, ensuring good practices of all ecosystem stakeholders, and ensure that rules set by transport service providers (for example requirements regarding their appearance in the final MaaS service interface) are respected. The system must be agile in nature and be developed and maintained in such a way that adjustments can be made to the technologies and requirements of stakeholders in the ecosystem.

The system must ensure that local authorities have access to data and insights for the regulation of the system, policy and infrastructure development.

To this end, access to the following transactional data appears necessary: the time of a journey, the actual travel time, the route including transfer points and the modes of transport used. In order to make regulation and system adjustments possible, usage ratios of transport assets (shared bicycles and cars) and the occupation of vehicles of carriers (taxis, ride hailing, public transport) become increasingly important for authorities.

With regard to privacy and data protection EMTA envisions a system of revocable consent that allows MaaS users to make informed decisions about whether or not to share data with a particular organization or service provider. The basis of this system is that users know what kind of personal data is stored and that data sharing processes are described in a way that is quick and easily understandable. The ability of a user to use a certain transport service must be disconnected from allowing service providers to store and reuse personal data. Insights and data that are extracted from the system, for example for policy or research, must obviously be abstracted in a way that is sufficient to protect the individual. Data access of local authorities and commercial stakeholders of the ecosystem should be limited to data relevant to their territorial jurisdiction or geographical area of operation. Needless to say is that the ecosystem needs to comply with applicable legislation. Especially data protection standards, such as the European GDPR and national data protection rules need to be taken into account in the creation of the regional public digital infrastructure.

TRANSPORT PRODUCTION LEVEL

The success of MaaS largely depends on the transport services that are integrated into the system. In order to offer all mobility options to customers, it becomes necessary that each transport provider is connected to the data integration system and also offers access to their respective transport products and services for external (MaaS) service providers.

Unlimited access to all transport products offered by the various transport operators and transport service providers seems difficult to achieve as vested interests and a need for differentiation of the own customer-facing offer amongst TSPs remains. To enable ecosystem integration, EMTA envisions a situation in which all transport providers in a region or city make a certain set of minimum standard products available for integration via standardized agreements.

For providers of commercial transport services (for example car sharing) this can be the standard rate per minute or kilometre and for taxi and ride-hailing services the standard calculated travel price. For public transport at least all transport products that are intended for occasional travel (single-trip, day and multiday tickets) should be accessible. In addition to these standard minimum products, public transport operators and transport service providers naturally have the commercial freedom to offer special offers to certain MaaS providers.

Transport service providers are expected to set certain requirements when granting access to their transport product(s). These requirements may relate to customer information needed to produce the service and be even required by law, but may also be of commercial nature. For example concerning the display of their transport product in the interfaces of MaaS providers with regard to brand visibility. These requirements as well as a statement with requirements concerning the actual transaction process, need to be reflected in standard commercial agreements that accompany each transport product a TSP makes accessible for integration.

It is expected that the sales channels currently employed by transport service providers will prevail dominant. If MaaS renders successful, changes in customer relationships may, however, offer opportunities for changes in product structures of TSPs to further increase flexibilization of mode choice. This might also provide for opportunities to reduce complexity in public transport fare structures for everybody, not just MaaS users.

INFRASTRUCTURE LEVEL

For the production of transport services, whether public or commercially organized, the underlying infrastructure must be realised by the public domain. While MaaS in itself does not provide transport capacity, limiting its direct infrastructural dimension, adequate supply of different modes of transport is a sufficient condition for the concept. And public infrastructure is the basic condition for the production of this sufficient supply of different transport modes. One issue with this, that needs to be addressed the context of MaaS governance, is the commercialization of public space, where private transport service providers use public space (e.g. parking spaces) for commercial purposes instead of it being available citizens.

From a public authority perspective, access to infrastructure and public space appears to be the most important instrument for facilitating and regulating the MaaS ecosystem and further aspects of the smart mobility transition. It is vital that the public agencies that own and manage our infrastructure are aware of the far-reaching consequences their regulation may likely have on the success of multimodal mobility. Regulation of access to infrastructure for transport services is the public sector's only tool to introduce and maintain the requirements for the development of a sustainable 'public value' MaaS ecosystem.

For MaaS to be successful in a sustainable fashion, making a set of standard transport products available for integration must become a lawful requirement for transport service providers to gain access to public space and infrastructure. Furthermore, must a balance be found between healthy stimulation of services and strict control for commercialization of public space. Situations in which service providers can develop into dominant players that create leverage against public interests must be prevented. The same applies to complex and longitudinal procedures for new services that would like to start operation. Effective regulation of access to public space for TSPs needs to address these aspects and furthermore guarantee the liability of the TSP to prevent situations where services and systems cause nuisance to citizens (e.g. through vehicles being misused or placed at unauthorized locations).

The role of municipalities in achieving this intended situation is of great importance, since the regulation of public space falls almost entirely under their jurisdiction.

EFFECTIVE SMART MOBILITY POLICY:

Strikes a balance between healthy promotion of new mobility services and strict control of the commercialization of public spaces.

Creates a fair and open market in the sense that every system that is based on safe means of transport and complies with the law, has the same opportunity to set up a transport service, without distinction.

Is somewhat flexible to allow for the growth of successful services, while monitoring negative developments such as monopolies (for example, through permits based on performance and usage rates of mobility services, with a maximum limit of services or resources per transport service provider).

Guarantees the liability and socially accepted behaviour of the transport service providers and their customers (for example through mandatory use of geofence to prevent means of transport blocking public spaces).

Facilitates the development of a multimodal mobility system (by making transport product access for integration requirement for transport service providers to gain access to public space and infrastructure.

Allows authorities and regulators to maintain control and understand how systems are used to prevent mobility behaviour from changing in a way that interferes with the strategic goals of the city and region (for example, by requiring access to usage data by means of transport and aggregated route data).

Reflects the need for a balanced development of services in both (central) urban areas and suburban areas, but recognizes that not all commercial service models are feasible in all parts of a city or region (for example by creating mobility hubs in less densely populated areas to bundle the demand for services and negotiate on a quit pro quo basis, giving a service provider access to profitable parts of the city or region if mobility hubs in areas with a lower population density (such as suburbs) are served if this is commercially feasible.

Outlook and further action

The research and collaboration effort on MaaS has shown that the concept may have beneficial societal impacts if it succeeds in making the sourcing of mobility more flexible and based on actual journey specific needs rather than long-term choices and ownership. Whether MaaS can achieve such flexibilization in travel behaviour is not yet clear and will strongly depend on the set up of the MaaS ecosystem.

Therefore, it is vital for authorities and cities to comprehend the potential benefits but also negative ramifications of each ecosystem model to adjust policy and strategies in order to have MaaS work for cities, regions and citizens. With this paper, EMTA hopes to provide a somewhat detailed transport authority and thus public sector perspective to shift the often tech- and solution-based MaaS discussion more towards question of overall ecosystem governance.

EMTA is committed to further facilitate discussion among its member authorities and collaborate with other networks, representative organizations and industry partners to reach an ever better understanding of the necessary role a transport authority is to play in MaaS and how metropolitan authorities and cities can cooperate best in the creation of a public value MaaS ecosystem.

In cooperation with Polis, the European network of cities and regions for transport innovation, EMTA will expand and further refine its understanding and discussion with the goal to create a common city, region and authority point of view on the development of MaaS in Europe in the course of 2019.

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The Effort brought together experts from various EMTA member authorities for a focused discussion. Without this discussion and the resulting great exchange of knowledge that enabled the collective creation of a somewhat holistic understanding of the MaaS concept and its relevance to transport authorities, it would not have been possible to create this paper.

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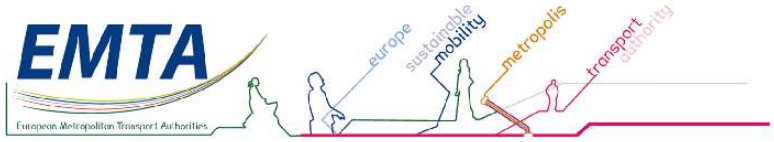
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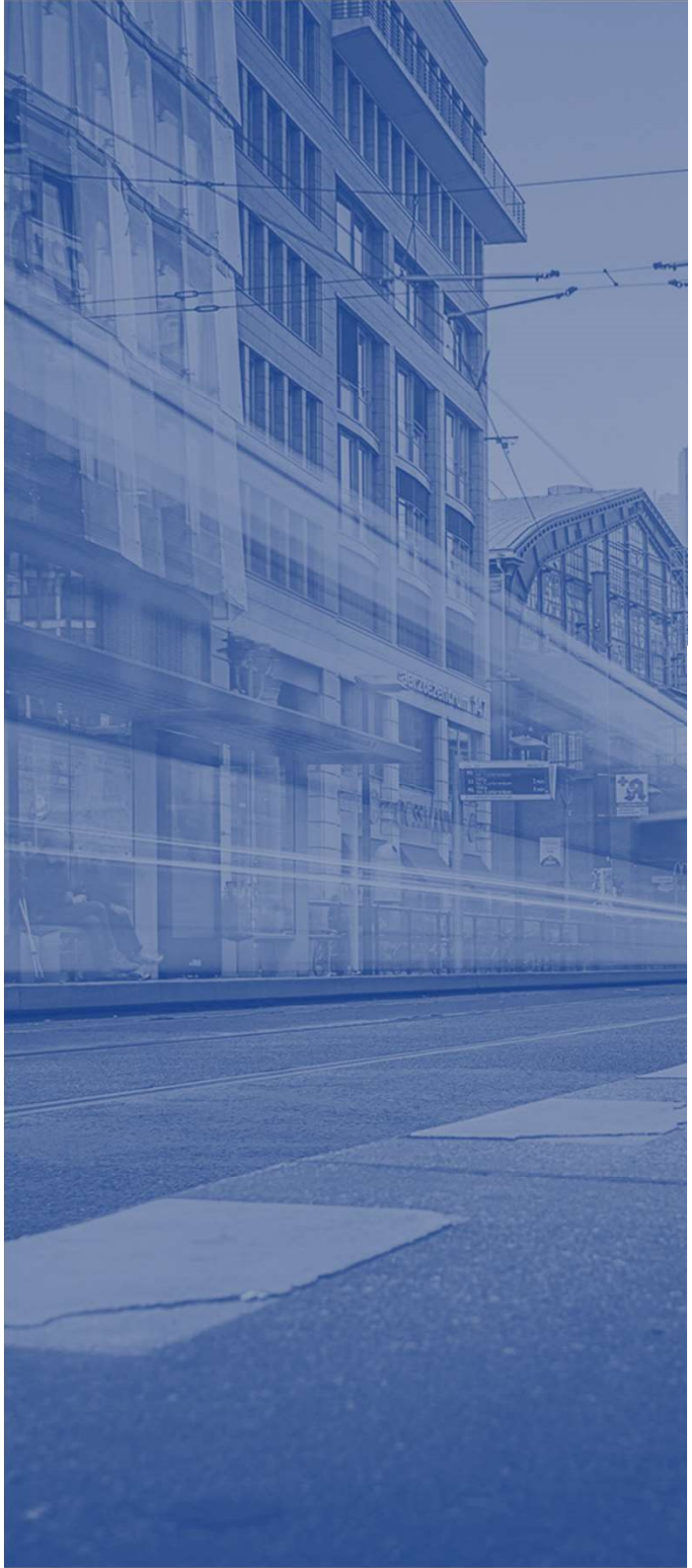

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