L.E.K.

Special Report

Mobility as a Service

The next transport disruption — a perspective from China

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Introduction:
Mobility as a service — the next transport disruption

Ride-sharing services like Uber and Didi are now a familiar proposition, especially for the young. They are transforming the way we think about mobility — particularly car use.

Ride-sharing services also alter how we relate to the cities we live in and travel to, making new areas accessible while enhancing the opportunities these spaces offer for living, work and leisure.

The concept of "mobility as a service" is, as yet, less familiar, but no less transformative.

While today's transport disruptors are mainly a few huge brand names such as Uber, Lyft and Didi, there is the prospect of disruption coming to embrace the whole mobility ecosystem, uniting different transport modes and providers under a single platform.

Mobility as a service (MaaS) brings together many transport businesses and the services they provide through apps that can do such things as providing a city-to-city journey with a single "one click" payment — even between countries. MaaS could potentially cover a taxi or ride-share to the airport at one end of a trip, the air fare itself, a train to the hotel at the other end, and perhaps even the hotel booking.

For consumers, MaaS will facilitate optimal mobility choices based on travel time, cost and other personal preferences such as preferred departure time or a desire to make green choices (i.e. use active transport).

For transport providers, it will make their products and services more visible and accessible, opening larger markets and, if they seize the opportunity, increasing revenue.

Less often thought about, but as important, is the opportunity for Governments to work with private transport providers to create or foster MaaS platforms that increase the use, productivity, and efficiency of public and private transport and associated infrastructure by coordinating and integrating multiple transport modes.
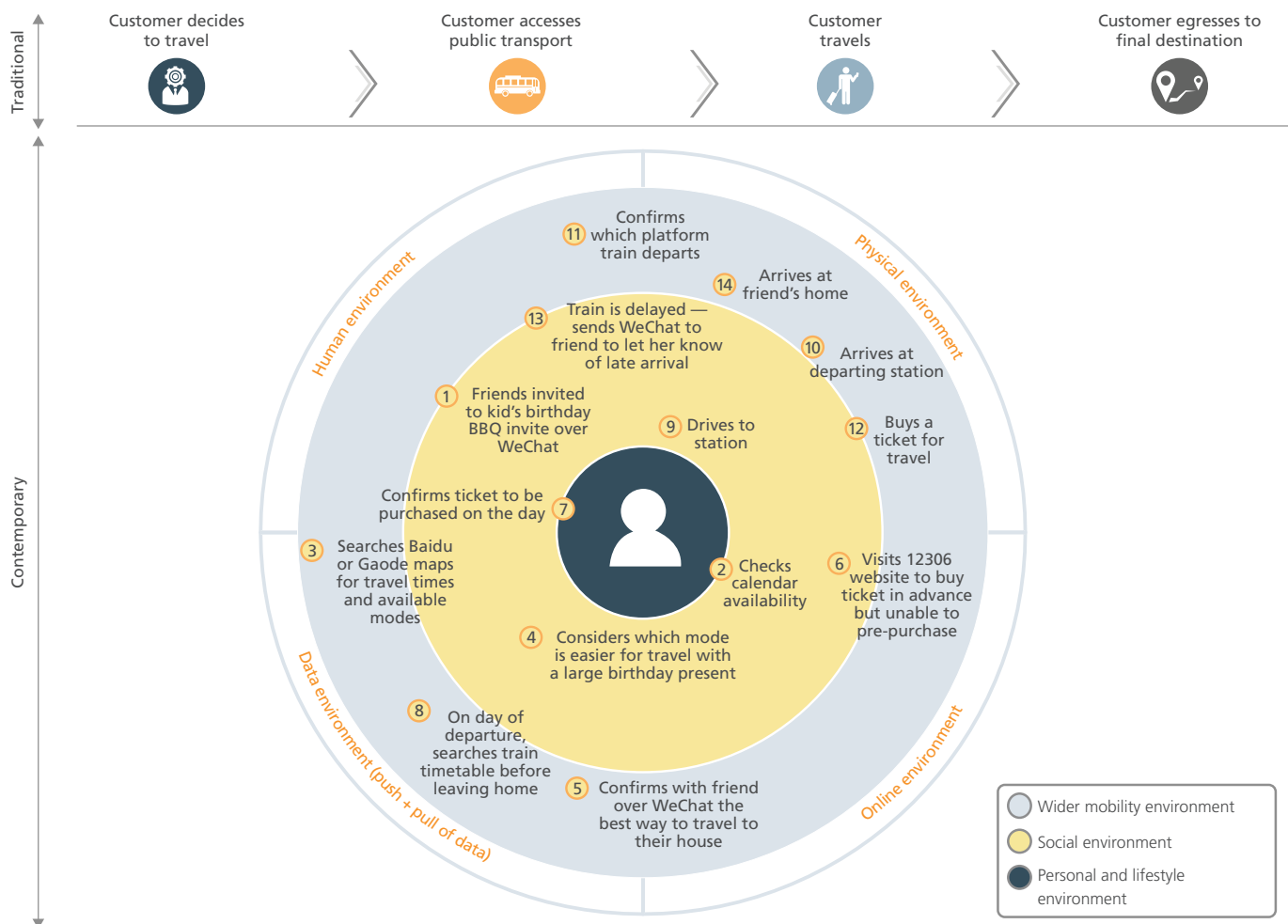
What is mobility as a service?

The way we use transport and the way it is provided are undergoing an evolution.

Sparked by the rise of ride-sharing services and the advent of electric and, eventually, autonomous vehicles, the transport ecosystem is becoming a complex web that brings transport services and infrastructure together with mobile technology and big data (Figure 1). Accordingly, planning and decision-making processes related to public and private transport provision need to be more agile and take into account a wide range of considerations.
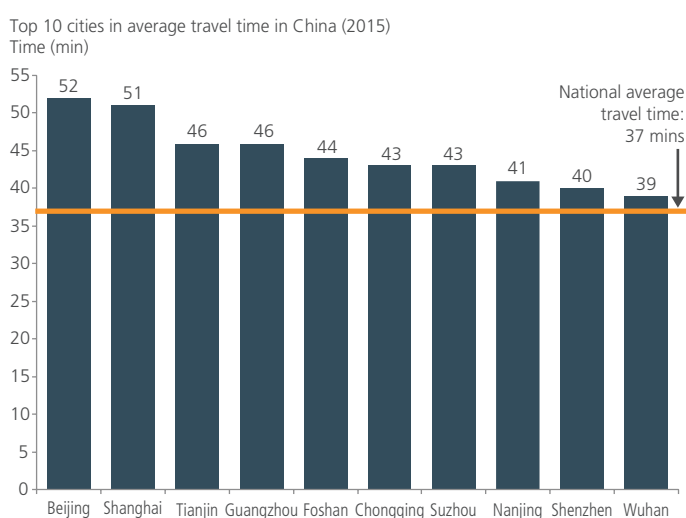
It is no longer credible for mobility planning to be characterised as a single, linear process of decision-making, but rather as a complex interrelated web of planning between the human, physical, online and data environments.

Figure 1
The web of mobility decision-making

Traditional

Customer decides to travel

Customer accesses public transport

Customer travels

Customer egresses to final destination

Contemporary

Human environment

Physical environment

11 Confirms which platform train departs

14 Arrives at friend's home

13 Train is delayed — sends WeChat to friend to let her know of late arrival

10 Arrives at departing station

1 Friends invited to kid's birthday BBQ invite over WeChat

9 Drives to station

12 Buys a ticket for travel

Confirms ticket to be purchased on the day 7

2 Checks calendar availability

3 Searches Baidu or Gaode maps for travel times and available modes

6 Visits 12306 website to buy ticket in advance but unable to pre-purchase

4 Considers which mode is easier for travel with a large birthday present

Data environment (push + pull of data)

8 On day of departure, searches train timetable before leaving home

5 Confirms with friend over WeChat the best way to travel to their house

Online environment

Wider mobility environment

Social environment

Personal and lifestyle environment

Within cities, urban expansion, combined with traffic congestion, has led to an increase in travel times. In a survey done by the Chinese Academy of Sciences, the number of cities where the average tr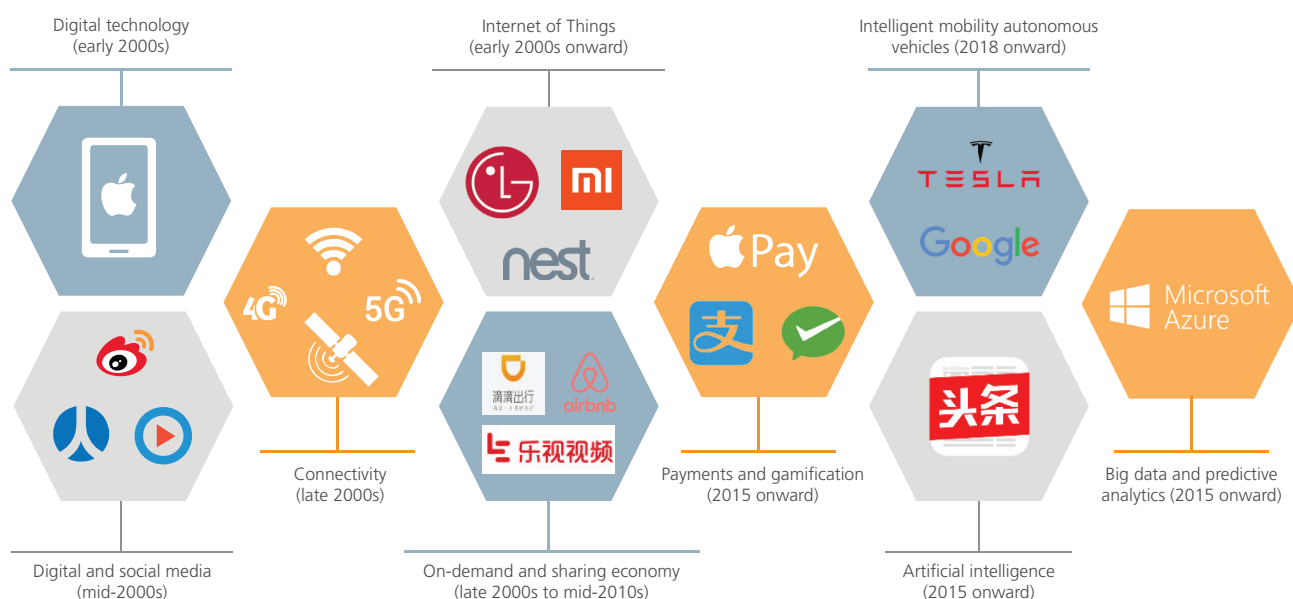avel time for work was greater than 30 minutes increased from 17 minutes in 2010 to 37 minutes in 2015. The average travel time for key cities such as Beijing, Shanghai and Guangzhou has increased by an average of c.10% from 2010 to 2015[1] (Figure 2).

As traffic congestion worsens, the use of private cars for a door-to-door journey is becoming less satisfactory when one looks at cost, travel time and other factors. But MaaS could be part of the solution to reversing this trend. As a transport delivery model, MaaS builds on contemporary social and technological trends to deliver seamless, personalised transport options and experiences. It will eventually be able to predict demand, suggesting the right service at the right time to consumers while allowing providers to better plan the supply of services. The market is ripe for this change: ride-sharing services have already significantly disrupted the travel market and changed what consumers expect from transport while opening new opportunities and markets for transport operators. All this has been enabled by the explosion in smartphone use, the rise of connected everyday devices and the real-time Internet of Things (IoT), the emergence of the sharing economy, and the abundance of data. These tools and trends are available to businesses and the public sector alike to shape the way in which customers consume mobility services (Figure 3).

Figure 2
Average travel time in key cities in China (2015)

Top 10 cities in average travel time in China (2015)
Time (min)

National average travel time: 37 mins

Figure 3
Shaping the digital era

Digital technology (early 2000s)

Internet of Things (early 2000s onward)

Intelligent mobility autonomous vehicles (2018 onward)

Connectivity (late 2000s)

Payments and gamification (2015 onward)

Big data and predictive analytics (2015 onward)

Digital and social media (mid-2000s)

On-demand and sharing economy (late 2000s to mid-2010s)

Artificial intelligence (2015 onward)

[1] The Chinese Academy of Sciences

MaaS benefits customers and transport providers

MaaS puts the customer experience first, increasing convenience, effectiveness, and satisfaction by enabling sharing and personalisation through real-time connectivity. It can be as deceptively simple as a single mobile app that coordinates access to and use of public, private and active transport modes. Service information, journey planning and payment for such diverse services as bicycle hire, ride-sharing, car-sharing, road tolling and public transport can all be brought together at a single point, with just one user account, where consumers can pay for a whole journey with one tap on the screen of their device.

This is a network-wide approach to mobility that presents users with the best choice for a particular time given their cost and other preferences, and better enables transport suppliers to meet travellers' needs. It requires a real-time exchange of information between the consumer and providers of transport services, allowing for better matching of customer needs, preferences and willingness to pay with the services that can be provided.

Another benefit of MaaS is that it supports mobility for those who currently find it difficult to access transport, including the poor, the elderly, people with disabilities and residents of communities that are underserved by public transport. All these groups can benefit historically from the availability of on-demand travel services that reduce the need to rely on making trips by private vehicle.

MaaS also has a wide range of additional advantages:

- Improving the quality and convenience of travel (i.e. on-demand, personalised, seamless and predictive journeys)

- Redistributing travellers to their most efficient mode of transport, in terms of cost and other factors

- Reducing overall transport times by informing network improvements

- Enabling better monitoring, management and planning of mobility services

- Potentially lowering traffic congestion and the environmental impact of transport

- Lessening the cost of mobility by widening the range of suppliers and increasing accessibility

- Enabling revenue growth for transport service providers, either by opening new revenue sources or enlarging the market

- Increasing regional responsiveness to the evolution and emergence of new transport services

Figure 4
MaaS key attributes
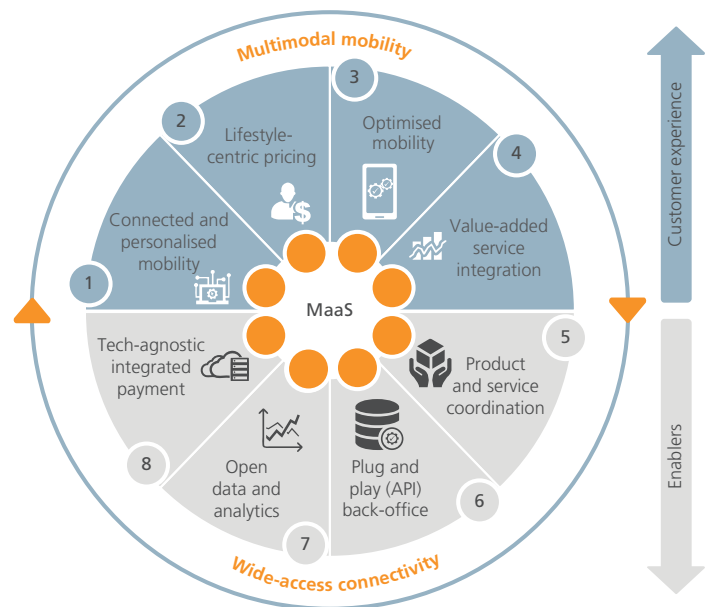
The MaaS delivery model has eight key attributes (Figure 4). Half are related to the customer experience and the other half to enabling technologies and processes. All are supported by widespread and reliable access to the internet. These cover varying degrees of functionality, take for example pricing under MaaS. It could begin with a stand-alone single mode pricing structure to a solution more integrated with customer lifestyle choices such as subscription pricing (i.e. pay a monthly fee for unlimited use of services) (Figure 5).

Figure 5
The evolution of pricing

Lifestyle-centric pricing continuum
Simple to advanced MaaS delivery
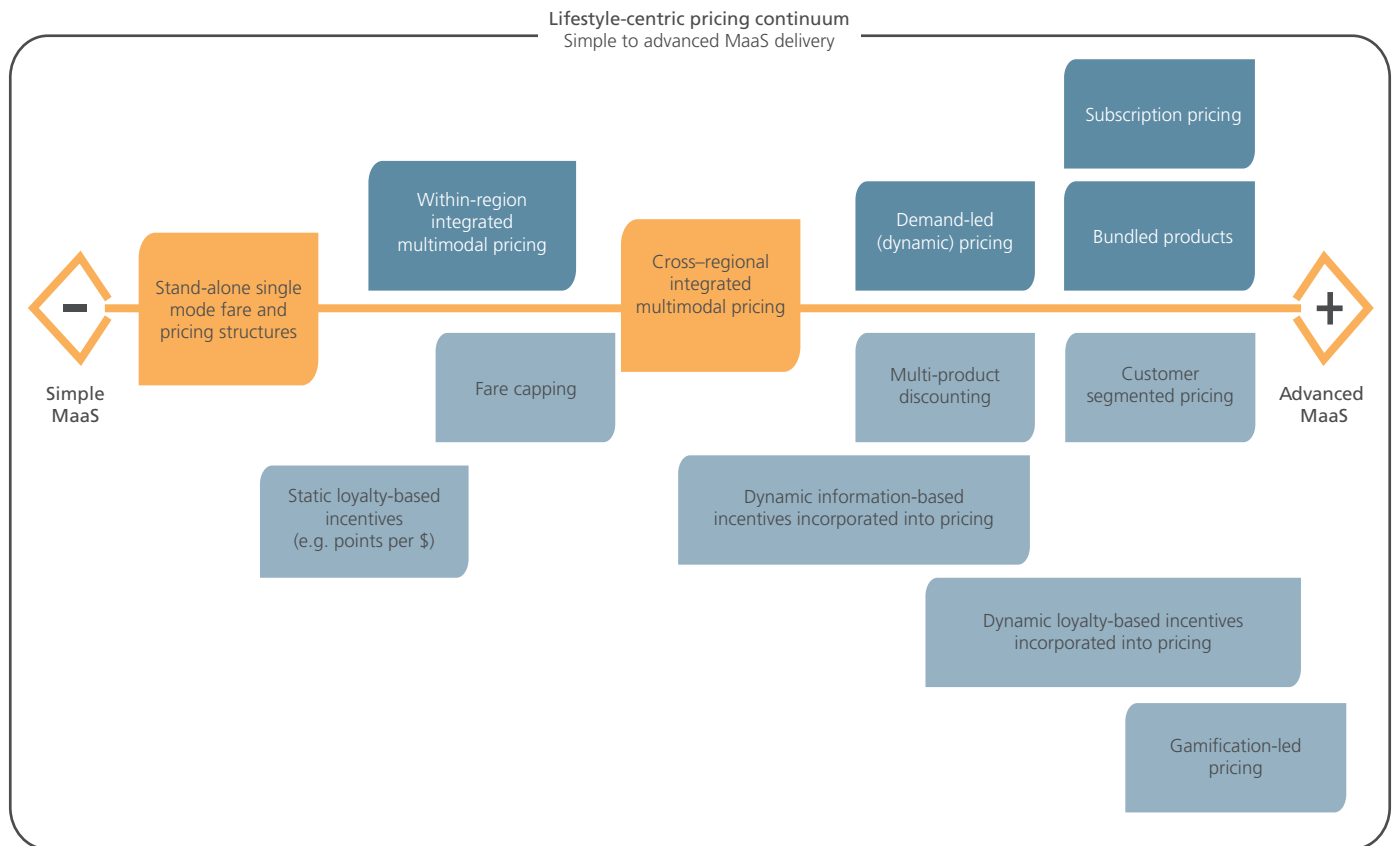
In an environment where MaaS is possible, traditional ways of thinking about delivering transport infrastructure for journeys that mainly use a single transport mode (e.g. car, bus, train), often between the outskirts of a city and its centre, can no longer be considered best practice. Planning needs to evolve to embrace the possibility of delivering an integrated solution that addresses what the modern consumer needs and expects from transport.

When is MaaS coming?

Although the concept of MaaS has been talked about in various forms over many years, progress towards its realisation has varied greatly between cities and across transport modes (Figure 6). Only now have technological, social and cultural factors converged to make it timely for transport authorities to consider what they may need and want to do to enable the further development of MaaS.

Because there is fragmentation in the connected mobility market, large technology companies in China have innovated to align their business models with MaaS principles though they have yet to be able to deliver on the full vision for a single app that can facilitate multimodal journeys from beginning to end.

The commercial development of MaaS encompasses both single-mode and multimodal journeys, value-added services, innovative products and pricing models, and real-time, on-demand service planning. The major deficiencies of current MaaS offerings are the lack of integrated payments and door-to-door planning for multimodal journeys. The participation of Government authorities in the MaaS ecosystem will be key to overcoming these limitations.

To date, Chinese regional public transport authorities have had no clear active participation in commercial MaaS offerings, though public transport service data has been pulled into commercial mobility journey-planning platforms.

While some may suspect that MaaS is a fad, big businesses are making a significant investment in mobility and the take-up of related apps, and it is hard to argue that this will not have lasting effects. Mobility disruptors have already presented business models with ground-breaking product offers and cost structures that have influenced consumer decision-making and expectations. This will have indelible effects on the delivery of travel service.

Figure 6
MaaS progress in key cities

Legend: ● Integrated into the value proposition / ○ Not offered within the experience

Degree of MaaS Customer Experience Integration →

Scheme and location	Description	Ticketing	Payment	Pricing	Value-added mobility services	Non public transport modes included
Smile: Vienna, Austria	Door-to-door integrated transport planner, book ticket and pay	●	●	○	○	●
Hannovermobil 2.0: Hannover, Germany	€10 subscription to a digital, one-stop mobility shop, with integrated mobile phone billings and discounted pricing	●	●	●	○	●
UbiGo: Gothenburg, Sweden	Monthly subscription starting at €150 per month, delivered via an app, enabling access to a range of transport modes; single monthly invoice	●	●	●	○	○
Whim: Helsinki, Finland	Subscription to public transport service model tailored to customer segments	●	●	●	○	●
Föli: Turku, Finland	An app which allows customers to real-time plan, ticket and pay; customers can be invoiced, paying by debit/credit card or through mobile phone operator billing	●	●	●	●	●
Emma Contracts: Montpellier, France	Single-key access to 30- or 365-day subscriptions to integrated transport packages	●	●	●	○	○

Source: L.E.K. analysis; Department for Transport, 2015, Feasibility Study for "Mobility as a Service" concept in London

On the one hand, personalised on-demand travel services such as ride- and car-sharing schemes could cannibalise public transport market share and reduce the ability of public transport to recover operating costs through fares, while also cutting local public parking revenues. This might seem an unhappy prospect for Governments. On the other hand, the disruption could present an opportunity to find new markets for various transport modes, provide cost-efficiency (e.g. by ride-sharing offering first- and last-mile services), reduce reliance on private vehicle ownership, decrease road congestion and increase public transport use. It may also enable Governments to consider network-wide pricing. How Governments respond to disruption, and whether they can embrace and facilitate the emergence of MaaS, could help determine which of these scenarios plays out.

So far, most transport authorities have approached the evolution of transport in a piecemeal way, creating apps that facilitate public transport use (e.g. journey-planning apps) or developing new but relatively isolated payment systems to support public transport only. The lack of integration between public transport services and privately offered transport can be an obstacle in moving towards MaaS. Creating an open and standardised platform to bring transport suppliers together in one marketplace allows customers to access "mobility" in a unified way — rather than as a collection of discrete journeys.

International MaaS success stories such as those of Helsinki and Turku in Finland (Figure 6) demonstrate that a frictionless experience, strong branding and customer trust are crucial aspects of MaaS delivery.

Opportunities for transport authorities

In areas such as MaaS, which involve technological innovation, change is rapid and ongoing, and there is a high degree of uncertainty about what shape the future will take and how organisations should prepare. However, the emergence of MaaS is almost certain to require significant coordination among mobility suppliers, as well as wide-ranging changes to a complex set of transport-related policies. At present, transport authorities should be considering the following strategic questions (Figure 7):

- What is our stance on MaaS?
  - Who should orchestrate it?
  - What are the potential delivery models?
  - Is a state-based, national or city-only model appropriate?
  - What is the strategic and economic business case for MaaS?
- How should network-wide transport policy evolve to accommodate an integrated mobility ecosystem?
  - What policy incentives, constraints and disincentives currently exist?
  - How can policy remain responsive and enabling?
- How can commercial and public organisations work together effectively to modernise mobility?

The prospect to deliver MaaS is growing quickly in both the public and private sectors. It is important for transport agencies to reflect on their ambitions for MaaS, consider their role in its delivery, evaluate alternative solutions and delivery models, and consider the organisational capabilities.
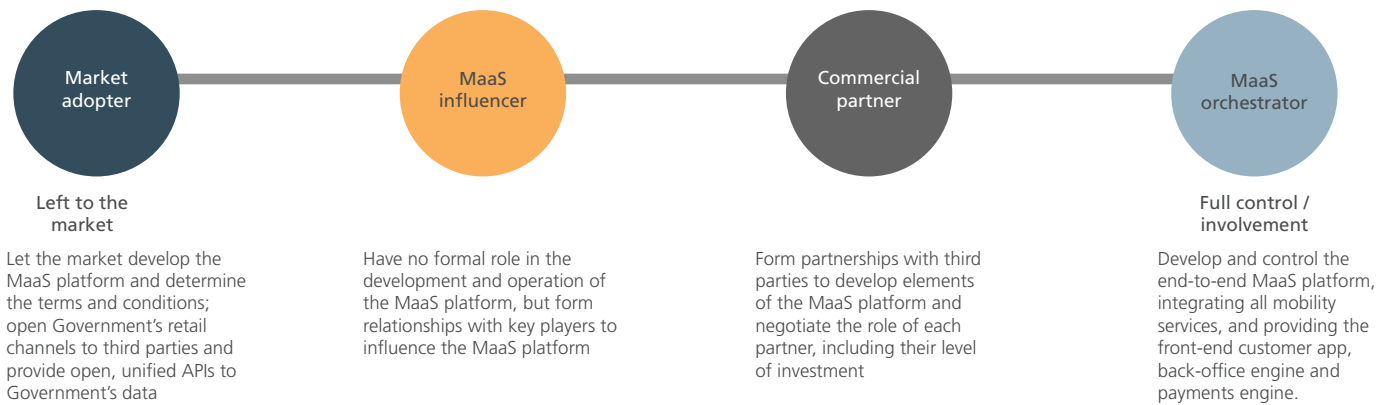
At this time, transport agencies can evaluate the digital proposition against the principles of MaaS, identifying gaps in their technology road map and aligning their activities with relevant strategic objectives. These road maps, and the value proposition made to customers, should incorporate elements beyond time and price in an effort to accommodate customers' preferences, such as their willingness to walk or cycle, or to trade time for money, their need to be productive while travelling, and their desire to optimise journeys for their particular needs.

Government can adopt a range of models to help transport providers deliver on their mobility ambitions: it can be an adopter, influencer, partner or orchestrator (Figure 8). The roles it selects will depend on the strength of transport operators' brands, their strategic approach to customer acquisition and retention, the funding sources they have available, their appetite for quality control, and their existing organisational capabilities.

Figure 7
Key policy questions for Government

Figure 8
MaaS delivery continuum

Market adopter

Left to the market

Let the market develop the MaaS platform and determine the terms and conditions; open Government's retail channels to third parties and provide open, unified APIs to Government's data

MaaS influencer

Have no formal role in the development and operation of the MaaS platform, but form relationships with key players to influence the MaaS platform

Commercial partner

Form partnerships with third parties to develop elements of the MaaS platform and negotiate the role of each partner, including their level of investment

MaaS orchestrator

Full control / involvement

Develop and control the end-to-end MaaS platform, integrating all mobility services, and providing the front-end customer app, back-office engine and payments engine.

Different MaaS delivery models will require different organisational capabilities. Transport agencies ought to consider what governance structures and team skills they will need to create to participate in MaaS ecosystems. For example, Governments or other organisations taking on a MaaS orchestrator role will find it places demands on their technical and digital development capabilities, as well as requiring strengths in partnering and contract negotiation in securing the involvement of third-party mobility suppliers.

Answering the strategic questions involved in developing MaaS will also require detailed evaluation of business case development and risk assessment. New approaches to business case evaluation will need to be thought through as evolving technology and new commercial models replace capital-intensive investments and traditional (business case) evaluation techniques. Innovative methods for drawing on customer insight, such as conjoint analysis involving augmented or virtual reality (e.g. to test the information delivery options) may also be needed to provide evidence for MaaS business cases in particular local settings.

Dialogue and teamwork are key

Providing end-to-end mobility for customers requires the involvement of multiple transport modes, infrastructure providers, levels of Government, businesses, technologies and innovators. Each shoulders different responsibilities. Tackling the challenge of offering better and more accessible mobility to all requires a system-wide perspective that can enable the evolution of transportation ecosystems, establishing readiness for the emergence of new mobility models and the realisation of their economic and social benefits.

Regardless of the way they choose to involve themselves in the development of MaaS, transport agencies have a role to play in engaging with mobility providers and a broader set of stakeholders,

information technology vendors, and emerging business and service models. Meanwhile, authorities can focus on public and private innovation opportunities, planning medium-term (three years and up), and technology road maps that are agile and integrate a wider range of stakeholders and business models. To promote these public and private innovation opportunities, Government could consider what partnership and industry incentives can be offered to support the ongoing development of MaaS.

MaaS represents a significant opportunity for all participants in the mobility ecosystem. Mobility suppliers will benefit from MaaS by using it to identify new market opportunities, hone their service offerings and optimise expenditure.

Governments will also benefit. The data platforms underpinning MaaS can be leveraged to plan the future of our cities, keep people moving efficiently, and avoid building expensive and unnecessary infrastructure by improving existing asset utilisation. Real-time network management will become a feasible strategy, helping reduce congestion and other problems.

As an emerging phenomenon, MaaS is unusual in having a scope that includes transport providers, Government and consumers, with far-reaching opportunities for all. To maximise the benefits that MaaS could deliver within the next decade, both business and Government would do well to begin thinking about, and acting towards, realising the promise of a single platform that offers consumers one-touch access to journeys that can span all the way from their front door to the skies and shores of distant lands.