

Levels of MaaS - Mobility as a Service

• By Jack Opiola

Mobility as a Service has the potential to revolutionize our lives. It also has the potential to go wrong and consume needless amounts of effort if stakeholders fail to align their needs. Here, Jack Opiola considers how a "Levels of MaaS" approach can smooth the journey to a more sustainable mobility future.

The premise of Mobility as a Service (MaaS) is a simple one: the seamless, infinitely adaptable delivery of mobility, together with associated information and payment services, across all modes of transport. All of this is to take place in near-real time or predictively, wirelessly, securely, and with the end-user being unaware of the potentially huge number of behind-the-scenes stakeholders and facilitators.

If that first sentence describes a simplicity, the second gives some indication of the reality. The delivery of something that, at the user-facing end, is as stress-free as possible is complex and reliant upon many inter-dependencies.

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MaaS is still, in many respects, a nascent concept. That it is beginning to exist at all is the result of a series of profound technological and societal shifts, some of which are continuing to evolve, and some of which are barely themselves emerging (see Sidebar — 'Pillars of MaaS'). It offers us some potentially huge positives in terms of the sustainability of mobility, but to be successful in its delivery or to continue its delivery by early adopters— especially in the near-term — we have to think about how we structure our approach.

Happily, within the ITS/mobility sector we have a recent precedent whereby order has been conferred upon a potentially massively disruptive influence. We can mimic what has been done to describe the levels of autonomy for Connected/Autonomous Vehicles (CAVs) and start to think about Levels of MaaS (LoM).

Driverless vehicles are going to have a major effect on business/professional and private road users alike. But to enable and guide those involved with their realization, it became necessary to define what "autonomous driving" actually means.

The Society of Automotive Engineering (SAE) outlined a series of levels of autonomy that have since been adopted universally. These give us a common baseline and, while individuals might not all be fully conversant with all of the technological and other details, they can at least share a common understanding of the roadmap which CAV manufacturers are using to achieve their long-term goals. What has emerged is a clear vision of the difference between each step of the journey to full vehicle automation and "driverless" vehicles.

The SAE's approach was simple — choose the main variable(s) that determine(s) each level of maturity and create a simple and straightforward description of the differences between each step. That included consideration of other industries and application fields with which there was common ground and shared needs. MaaS can take a similar approach.

Despite MaaS's infancy, concepts are being discussed and challenging business models put forward. Players are making a genuine effort to understand their roles and the fit with their strategic goals, and travelers are wondering about how MaaS may affect them. Communications, collaboration and cooperation are central to developing what may be a true revolution in managing and providing mobility services amongst the players outlined below.

Human intervention — the defining variable

Much like the levels of autonomy for CAV, the degree of human intervention decreases as MaaS maturity progresses up the scale. This defining variable has been chosen for its simplicity, singled out from several not-so-relevant others. By comparison, some models for producing a MaaS index of maturity use multiple characteristics to feed a complicated algorithm. The result is a somewhat sterile and abstract number that loses its meaning amid the methodology to produce it. Figure 1 visualizes the key defining variable approach. Figure 2 shows the extremes of the scale from the traveler's point of view.



Player	Role	Expectations
Traveler	All services to be included are designed to benefit the traveler. The traveler is the end-user. The level of automation in every single interaction should determine the level of MaaS.	The traveler should be given as many options as possible. Each option or suggestion should provide the most advantageous trip given the traveler's individual preferences. The suggested options should mean as little interaction as possible to activate services and absolute clarity on data collected and assurance of its privacy and security.
Private Operator	Provide the mobility services as presented and operate their services and systems in a timely and reliable fashion providing continuous near real time updates and notices.	To be able to deliver services in a competitive environment, based on well-thought commercial and marketing strategies.
Public Transport	Provide the mobility services as presented and operate their services and systems in an open, timely, and reliable fashion providing continuous near real time updates and notices. Linking public service and mass transit with private operations will improve efficiency and economic outcomes.	That people will prefer public transport and mass transit options, considering service quality is improved through less individual transport traffic inside cities. Rely more on intelligent solutions, optimizing investment application in infrastructure, operations and fleet.
Central Government	Coordinate, administer, legislate, and moderate mobility services in the jurisdictional entity. The goal is a benefit, overall range of mobility services for citizens in their jurisdiction. Central Government creates the legal and administrative framework that allows MaaS to happen, acting as the catalyst by promoting mobility policies and supporting legislation for open standards, as well as privacy and economic protection for its citizens.	To implement mobility policies aligned with safer and more sustainable transportation modes, with mechanisms to encourage specific transport options.
Technology Providers	Provide technological mobility solutions for the roadside, smart phone apps, wearables, onboard and central systems. These must comply with the legislation and policies established by government and be acceptable to the traveler and mobility providers of the jurisdiction. In addition, contribute to define open standards (data and architecture) for IoT generalized presence and work as differentiation enablers for travelers, operators and meta-operators.	To be able to sell and supply their apps, systems and experience, using the most advanced and differentiated solutions that meet both customer and operator needs in the jurisdictional framework established.

Players

The MaaS stakeholders (Table 1) have distinctive roles to play in maximizing the chances of success for themselves and seamless mobility services. Their expectations and ambitions will determine the overall adoption and acceptance of MaaS.

Level 0, the base level, is readily relatable to services available today. Paradoxically, it is unfortunate that the available mobility services are so numerous. Each provides only part of an end-to-end journey and the traveler must switch between and manage them individually. Access, functionality and payment options, where they exist, can be extremely limited.

By contrast, Level 6 is the overall integration of all mobility and other digitized services. So, on any given day, the traveler's smart home recognizes his/her departure and shuts off lights, locks doors and sets home heating and cooling services to maintain pre-arranged, individual levels of comfort. Any security services are activated.

Simultaneously, arrival at the workplace is determined and all modes of transport fitting the traveler's preferences

are reserved, ticketed and realized. The travelers' arrival time is also used to prime environmental and other services at the workplace. At the other end of the day, the process is reversed and the near-real-time monitoring of mobility services seamlessly suggests routing and services, ticketing and payment appropriate to the traveler's needs in terms of journey time and other factors such as carbon footprint.

Level 5 already saw the traveler's level of intervention set at minimal to none; Level 6 adds active artificial intelligent choices based on traveler-specific behavior and profiling. In parallel, all anonymized data is provided to public and private operators, as well as government transportation planning services to enable planning of further improvements to services and performance.

Now that the boundaries are defined, we should consider the remaining stages and their high-level characteristics.

Using LoM

The abundant knowledge and active discussions which are taking place will continue to foster the environment for perfecting the MaaS model. Having a common framework

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within which to promote communication effectiveness and foster smoother discussions will focus the energy spent by each stakeholder on the emerging issues and shared needs, while focusing on the end user.

The common framework suggested above should help both communications and understanding of a roadmap that MaaS may follow and create a greater environment of acceptance from all players.

With the levels of MaaS services as outlined above, one does not have to know the details and underpinning technologies. The framework provides a common understanding of the roadmap of how stakeholders – public and private, government and technology providers — can describe their long-term goals. Everyone can have a clear vision of where they are on the path to a fully automated MaaS reality and what the next level may be for planning and budgeting.

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Because it is still so new, it is a real challenge to provide a business model for all MaaS stakeholders. This is precisely the point at which clarity is needed and should be fostered. LoM helps provides that clarity.

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Levels of MaaS Table 2 - Sidebar

Level	Description	Explanation
0	This is the base level, repeatable with today.	There are account base systems in place, individual modes of transportation already have a digitized interface and the traveler has information available online for each.
1	There is one-to-one integration between some private services.	Duets of services start to develop joint offering (e.g. tolling+car park, private car+ferry, and car park+ride, bus services)
2	Integrated payment and ticketing across modes of limited public and private modes of transportation services.	In this level, greater integration occurs but this time between a private operator and a public transport mode of operation. Integration shows promise but other PT modes skeptical and continue to stay a poof.
3	Unified interface for single account used in multiple modes of transport services.	Instead of having multiple channels, interface is unified across modes, providers and services that the traveler finds necessary for journeys are provided by a single meta-operator through a Traveler account.
4	All modes are integrated, private and public, including routing, ticketing, and payment.	Open data and standards are defined and commonly used by all transportation providers and MaaS meta-operators to provide services for Travelers.
5	Active artificial intelligent choices are taken based on travels preferences and near real time data for ad-hoc changes to a journey.	Based on traveler specific behavior and profiling, minimal (to none) intervention is needed by the traveler for an end-to-end journey based on the traveler's preferences, past travel history, and filters.
6	MaaS connects beyond mobility, interacting with IoT's, smart building, and smart cities.	As MaaS evolves, so do other systems involved in the traveler's day, such as smart work spaces, smart homes, smart cities, and general services (e.g. food, groceries, entertainment, sport, culture) to provide convenient and seamless interface with the Traveler's eco-system.