MaaS: Opportunities for Improving Mobility Services

*1V. K. Gahlot, 2A.K.Sharma, 3P. Kalla, 4P. P. Dahale
1CMG Center for Research & Sustainable Development (CfRSD), Jaipur, Rajasthan, India
2,4 Ramdeobaba College of Engineering and Management, Nagpur
3Department of Civil Engineering, MNIT, Jaipur, Rajasthan, India
Email: vgahlot@rediffmail.com, sharmaak@rknec.edu , pawankalla@rediffmail.com, dahalepp@rknec.edu

Abstract

Mobility as a Service, referred to as 'MaaS', represents the opportunity for all available public and private transport services to be integrated and bundled into a platform directly accessible by the individual travellers through their mobile devices, enabling door-to- door journey, with clear options on travel time, transport modes, and price, and centralising journey information, journey planning, service reservation, and payment. This concept is challenging the conventional transport landscape with potential new players set to take a key customer-facing role going forward as MaaS operators, and existing roles and business models required to adapt. The development of MaaS in Indian Sub-Continent will likely be shaped by market opportunities. For implementing MaaS in Indian cities, it will require strong public-sector leadership to develop integrated mobility strategy, understand and support the new business models that MaaS implies, and assess and manage the impacts on existing services and legislation, including existing and planned public transport infrastructure and services.

Keywords

Mobility as a Service, Urban Transport, Integrated Payment, On-Demand Transport, Multimodal Transport

Introduction

Ever-increasing pressure on household transport budgets, the proliferation of transport options directly available to customers, and a general shift in our economy towards collaborative consumption are changing the traditional transport landscape. As travel behaviour and demand evolves, new industry players are placing themselves between customers and traditional transport providers, challenging the way public infrastructure and public transport services are planned, designed, operated, regulated and funded. This disruption is pre-empted by a shift away from personally-owned transport modes towards mobility solutions that are consumed as a service. The concept is referred to as Mobility as a Service (MaaS) – a term that has been gaining worldwide attention under the early leadership of Northern European countries.

Mobility as a Service (MaaS) provides new opportunities to improve customer travel choice and support greater efficiency in how our transport services are provided. The Urban Transport Planners view MaaS as a significant opportunity to use Intelligent Mobility innovation to realise benefits for industry and travellers. Global interest in MaaS is growing and the concept is gaining the attention of passengers and private sectors. MaaS, as a concept, is broader in scope than seeking to improve just one aspect of our travel experience, such as ticketing or journey planning information. Instead MaaS seeks to transform the way in which we choose how we travel from A to B and it provides an opportunity for policy makers to secure benefits for society**.**

Methodology

Following methodology was adapted for this study:
i. Study of various mobility environments
ii. Study of different types of urban transportation systems.
iii. Study of different service environment
iv. Collection of mobility data including modal choice
v. Collection of data related to service providers.
vi. Study of mobile app used in City of Helsinki for efficient mobility of people and goods
vii. Suggesting mobility services for Indian Cities.

Mobility as a Service (Maas)

There is currently no single, agreed definition for MaaS due to the rapidly changing nature of technological innovation in the transport sector. MaaS is being developed by various public and private stakeholders across global markets, leading to ambiguity as each entity adopts their own unique terminology. Examples of this include the same term being used to describe services with different characteristics, or differing terms being used to describe various services or concepts, including Mobility as a Service, Transport as a Service, Demand Responsive Transport, On-Demand Transport. Conventionally our mobility has been provided for managing

fleets of vehicles around networks, framed by strategic transport planning objectives. MaaS, as a service model, turns this on its head by putting the customer first and developing the mobility systems around customer preferences. MaaS offers an opportunity to improve how people and goods move, both from the perspective of the policy maker and for travellers themselves.

The 'as a service' business model that is integral to MaaS is commonplace in many digital enterprises, for example, the IT sector's success with 'Software as a Service.' The term mobility is chosen instead of 'transport,' because the service model is associated with understanding the 'who?' and 'why?' of customers' mobility requirements and only then is the transport solution offered as the 'how?' In this way MaaS is seen as consumer-centric and MaaS Providers can match a mobility solution to an individual consumer need. Consumers in many parts of the India already make use of MaaS related services. These are associated with navigation, journey information, and cashless payment as well as managed access to transport services including taxi, bus, rail and shared transport journeys.

As per MaaS Global (2016) a mobility distribution model that delivers users' transport needs through a single interface of a service provider.[1][3] It combines different transport modes to offer a tailored mobility package, like a monthly mobile phone contract. The definition of MaaS encapsulates the ability for the service to offer any type of travel experience using any form of transport service, public or private. Market conditions will shape the MaaS offerings made available on the market (Table 1) and it is expected that innovation in MaaS will result in consumers having a wide range of mobility services as well as the choice of Transport Operator services that MaaS offers the consumer. Research has identified a set of MaaS customer experience features that will be valued by the customer [2]

Feature	Benefit Perceived by Customer
Personalised Service	A personalised service that builds a relationship between the customer and the MaaS provider, So that relevant travel choices can be anticipated and provided.
Ease of Transaction	The customers can conveniently access transport operator assets and services by buying a range of devices, for example a smartphone, smart watch or bankcard.
Ease of Payment	The customer can pay for their mobility to suit their needs – choice of pay-as –you-go, pre-pay or post-pay including the use of a monthly subscription model can be offered.
Dynamic journey Management	The customer is provided with a dynamic journey management service that keeps the user informed in real-time if their journey expectations will need to change.
Journey Planning	A journey planning service allow a customer to plan their journey based on their personal preferences – for example, time, cost, comfort, convenience.

Table 1: Potential Customer Experience Features of MaaS

MaaS Ecosystem

From the user's perspective, a journey is undertaken using one or several transport options available from the overall mobility environment, and is enabled through several interactive steps for journey planning, booking, payment and ticketing services. This section explains the aspects of both the mobility and service environments that Mobility as a Service aims to bring together.

Mobility Environment

The number of modes and transport services that are available to customers has increased in recent years. Before the introduction of the sharing economy, there was a sharp distinction between public and private transport with clear roles for various public and private stakeholders in governing them. The recent proliferation of new shared transport services by private stakeholders has blurred these lines considerably, creating a much more complex transport market. This section gives an outline of the broad array of transport products that are available in the current transport landscape, and available to be integrated through MaaS. [4]

Fixed Public Transport

Public transport is the most traditional form of shared mobility: all Metro cities have established their public transport networks under National Transport Policy with various combinations of metro, BRT, Sub-urban rail, light-rail, City bus and ferry services. Today, many customers in Indian cities can interact with the public transport system as a unified, multimodal network instead of managing their journey as a series of separate single mode trips.

Flexible Public Transport

Public transport also encompasses a range of mobility solutions that aim to improve access to traditional public transport options, tailoring the public transport offering to more specific customer needs, and overall increase the attractiveness of public transport. Such 'flexible transport' or 'intermediate mode' solutions already exist with new forms recently gaining significant interest in the form of Demand Responsive Transport (DRT), On-Demand Transport (ODT) and autonomous shuttle trials. It is also important to note that these forms of flexible transport services are not MaaS-specific services, but rather new and innovative mobility modes that have the potential to feed into a MaaS ecosystem alongside existing services.

Personal Transport

Private vehicles, carpooling and 'Park & Ride'

Privately-owned cars are the most common form of personal transport in every Indian city as they are perceived to offer the greatest flexibility and freedom of travel. Most urban transport policy to date has focused on strategies to reduce private car use to reduce road congestion and infrastructure needs.

Private cars are also often used for carpooling, defined as 'two or more people agreeing to travel by private car together, to the same destination, a destination along the route or within the vicinity of the driver's destination'. Importantly, carpooling is a non-commercial operation, privately agreed upon for mutual convenience, and is most commonly used for work-commuting or other purposes. Although carpooling is usually informal, some private companies have begun to offer services to facilitate these arrangements in Pune and Bangaluru.

Private cars can also encourage public transport use and extend the coverage of networks with 'Park & Ride'. 'Park & Ride' encourage commuters to use public transport instead of driving to their destinations, and are most often located at train or bus stations in the outer suburbs of cities and in areas not well serviced by feeder networks. The Delhi Metro has successfully used 'Park & Ride' to shift choice riders substantially.

Taxis and Rideshare

Dial-a-ride and Ridesharing services have been a disruptive force in the Indian transport industry, most notably since the launch of Uber (2009) and Ola (2010) in Metro Cities. Ridesharing services can offering multiple options such as: access to different vehicle sizes and classes, the ability to share rides with other customers, the ability for corporate organisations to provide their employees rides for business purposes, or the ability for healthcare organisations.

Car-sharing

Private cars are resource-inefficient, spending 95% of their time parked and unused. Car- sharing offers an alternative to personal car ownership by giving users access to a private vehicle for personal use on a short-term, pay-per-use basis (3). The services are particularly popular in high-density urban areas, where many residents do not drive daily but want to retain access to a car at certain times. It is estimated that each shared car can replace the need for 12 private vehicles. Shared cars are often located throughout neighbourhoods in private or designated on-street parking, and can be hired on an hourly or half-hourly basis. Cars are hired and unlocked via a smartphone app.

Active transport

Walking and cycling are an important part of the mobility landscape as they facilitate local travel and often form the first and last mile of longer journeys involving public or private transport as the primary mode. In addition to 'Park & Ride', many public transport authorities encourage walking and cycling to train stations and transport interchanges by providing safe pedestrian facilities, end-of-trip facilities and secure bicycle storage.

Micro - Mobility

New micro-mobility solutions are constantly being developed and tested with the objective of offering an alternative for short trips (less than 4–5km). As such, they promise to significantly impact the traditional mobility environment. Docked bike share programs owned and managed by the city's public transport authority have been operating for several years now. Users can hire bikes short-term and return them to docks across the city for one-way travel, usually using their public transport smartcard. Dockless electric scooters (also referred to as e-scooters) emerged in late 2017 in San Francisco.

Service Environment

Journey Planning

Journey planning is supported by timetable information relating to public transport services expected arrival and departure times at stops and stations, route data, real-time information of public transport vehicles' location, and real-time estimates of variances from planned timetables. This information is available at public transport stops and stations. It is now common practice to provide this information in various digital formats: most public transport authorities offer website and/or app-based journey planners that include public transport modes and walking for the first-mile and last-mile journey component. These journey planners have been an enabler in creating integrated, multimodal public transport networks by allowing customers to plan multi-leg journeys as they travel.

The General Transit Feed Specification (GTFS), as a pre-defined format in which many public transport operators voluntarily supply static timetables, route data and real-time public transport tracking information, has allowed many third-party apps to integrate this data and present it to customers with a combination of other services. The Google Transit app, for instance, integrates the GTFS feeds from most public transport operators providing a global journey-planning service across cities and countries. Such third-party apps start to provide some level of integration between transport modes (public or private) as options available to customers, but lack payment integration services. [5]

Booking

Public transport services do not require a customer interface for booking and scheduling as they rely on fixed timetables and fares, meaning that customers simply 'turn up and go'. Newer services such as on-demand public

transport and rideshare require users to book or call the service. This has been enabled by the high level of mobile smartphone penetration but adds a potential barrier for specific customer segments. Considering this potential risk, many trials of on-demand public transport have included telephone booking to ensure they do not exclude vulnerable users.

Payment and Ticketing

Payment and ticketing are fundamental aspects of all transport services and have varying characteristics for different service types and in different markets. Most public transport systems in Indian cities currently use a combination of smartcard and paper-based ticketing with multimodal integration and either fixed or distance-based fares. Personal mobility services have more varied pricing and payment methods. Instead of using smartcards, these services generally rely on credit card payments that the app facilitates directly. Pricing also varies for different types of services, such as distance and time-based pricing for car-share and taxis, distance, time and demand-based pricing for ridesharing services, or incremental time-based pricing for bike-share.

Smartcard Integration

Some public transport operators have experimented with integrating private services into their smartcard ticketing systems. In Delhi Metro for example, the Common Mobility Card initiative allows customers to pay for privately used shared ride and Metro ride by CMC card.

Contactless Payments

Contactless ticketing products allow customers to pay public transport fares directly using credit/debit cards and mobile payment devices instead of a dedicated smartcard. These services are often more convenient and allow customers greater flexibility. However, there are some limitations: existing smartcard-based systems offer discounted concession pricing, weekly fare caps and other incentives, while most contactless systems do not offer concession pricing as the customer's eligibility for these discounts cannot be verified.

Account-based Ticketing

Account-based ticketing systems can provide a solution to resolve the disconnect between the benefits and limitations of smartcards, contactless payments, and other payment methods by allowing customers to register multiple payment sources to a single account such as a 'Mobility ID'. By registering all of a person's payment methods to a common ID, account-based systems can maintain benefits such as concession pricing and fare caps while enabling the flexibility of using multiple different devices.

Mobility data

Mobility data includes data relating to the actual movements of individual customers or vehicles. These anonymised datasets are aggregated through surveys (e.g. household travel surveys capturing the purpose of trips) or various detection technologies (e.g. smartphone location data and traffic detection data). Combined with public transport performance data, these datasets play an increasing role in designing and planning public transport services and infrastructure development. Although it is common for governments and public operators to release robust and up-to-date open data, private operators of public transport and rideshare services have been more reluctant to release operational data for fear of losing a commercial advantage. This lack of information sharing can create challenges to understanding customer travel behaviour and service performance across the mobility ecosystem.

Objectives of MaaS

Governments, non-government organisations (such as academic and advocacy bodies) and commercial entities have differing motives and interests in the development of Mobility as a Service. Some parties may gain unpredicted or unfair commercial advantage from certain principles if not sufficiently analysed. To avoid such outcomes, governments and transport authorities have an important role in formalising MaaS objectives and in being able to assess their delivery and respect. [3]

The key MaaS objectives emerging from the global industry:
- Positioning public transport at the core of the mobility environment
- Increasing vehicle occupancy by discouraging the use of single-occupant vehicles
- Using existing infrastructure capacity more efficiently by reallocating road space
- Improving transport-land use integration, streetscapes and urban environments
- Improving transport access, fairness and social equity.

MaaS Stakeholders

MaaS brings together a diverse range of stakeholders each with different interests.

Transport Authorities

Transport authorities have a responsibility to ensure fairness and equitable access for the community. As previously discussed, authorities have a vital role to play in reinforcing fairness and equity as private services become a larger part of the transport network under MaaS. As the transport ecosystem changes, the role of public transport authorities may also expand to include areas such as managing an integrated transport system, supporting transport infrastructure, and interfacing other modes of transport with the public transport network.

Public Transport Operators

Public transport operators are distinct from transport authorities and include both publicly owned and commercial operators of traditional public transport services. Operators of train, bus, flight, rail and ferry services are important stakeholders in Mobility as a Service as their services have felt pressure from new mobility services such as ridesharing. Public transport operators will also become important stakeholders under a successful MaaS ecosystem that encourages public transport use as the core of a journey, supported by other services for first and last mile travel. Public transport operators are subsidised and regulated by service contracts, and it is important that these contracts are flexible enough to allow public transport services to adapt to new transport modes and behaviours.

Private Mobility Operators

Private mobility operators include new players in the transport marketplace like rideshare, bike- share, car- share and other unsubsidised transport services. These operators are typically more lightly regulated than public transport operators and operate profitable services without government subsidy. Private mobility operators may ascribe to community values; however, they are ultimately driven to prioritise profitable services over coverage or social equity.

Car Manufacturers

The nature of private vehicle use is changing due to factors such as declining driver's license rates, the shift towards shared transport services, fleet ownership, and the pending transition to autonomous vehicles. Although a risk of reduced private car sales is acknowledged, many manufacturers are preparing to capitalise on a shift towards MaaS and shared mobility services by redefining themselves as 'mobility providers'. A growing interest from automotive OEMs (Original Equipment Manufacturers) for mobility services is also indicating a shift in the way mobility will be offered in the future.

MaaS Service Providers

The MaaS service providers encompass the distinct roles of MaaS Operator and B2B integrator. The MaaS Operator brings together a diverse menu of transport options via a mobile application and offers mobility packages directly to customers in the form of monthly subscription plans or individual trips in a pay- as-you go model. The MaaS Operator negotiates partnerships with individual transport providers to be allowed to resell their services. It may purchase bulk transit services from individual transport providers to increase the attractiveness of proposed mobility packages, as well as its own commercial viability.

Behind the MaaS Operator, an essential prerequisite for effective deployment of a MaaS ecosystem is an open middle-layer platform to connect the transport service providers with the MaaS operator. This Business- to-Business (B2B) platform needs to be established with common rules, standardised interfaces (APIs) and consistent governance, enabling multiple business models and removing the need for each stakeholder to individually address technical and organisational obstacles. The B2B platform can be managed or operated by an entity (B2B integrator) distinct from both the transport service operators and the MaaS operators.

Customers

Customers and end-users are the most important stakeholder in Mobility as a Service. For MaaS to be successful going forward, it must provide convenience to customers as well as provide financial savings to these customers in comparison to the traditional model of privately-owned vehicles. Although current targeted MaaS customers are mainly young generations who wish to adopt a sustainable lifestyle, MaaS may offer great benefits to elderly travellers and play an important role in meeting travel demand for an aging society. This is the first elderly generation who are used to smart phones and internet, paving the way for a one-stop solution to access and pay for all types of transport modes as a solution for elderly travellers. Although smart phone use is becoming more common across all demographics, other potential barriers remain: a lack of internet access or proficiency amongst elderly smartphone users, and a lack of concession pricing and disability/mobility access for new service types. Each MaaS application may target different customer segments and will contribute to better understanding local needs and interests as well as the evolution of culture towards shared mobility.

Non-transport Stakeholders

Outside of the transport ecosystem, a range of other stakeholders will benefit (both directly and indirectly) from the greater connectivity achieved by Mobility as a Service. This group can include developers, land owners and tourism operators.

Case Study: Whim app – Helsinki

The City of Helsinki became one of the first cities to establish a transport vision that offers all residents (with or without a private car) equal access by 2025. To achieve this, the city has actively sought transport initiatives that improve access without car ownership, with MaaS perceived by the city as a strong proposal in support of this strategy. With strong support from the city government, the Whim mobile app was introduced in autumn of 2016. The app combines several transport modes, including public transport, taxis, car-share and bike-share schemes into a single monthly payment contract. After achieving early success in Helsinki, the app was rolled out in Amsterdam and Antwerp in 2017 and Birmingham in 2018, presenting itself as a successful example of a

MaaS service operating across four European urban centres with different populations, transport operators and regulatory environments.
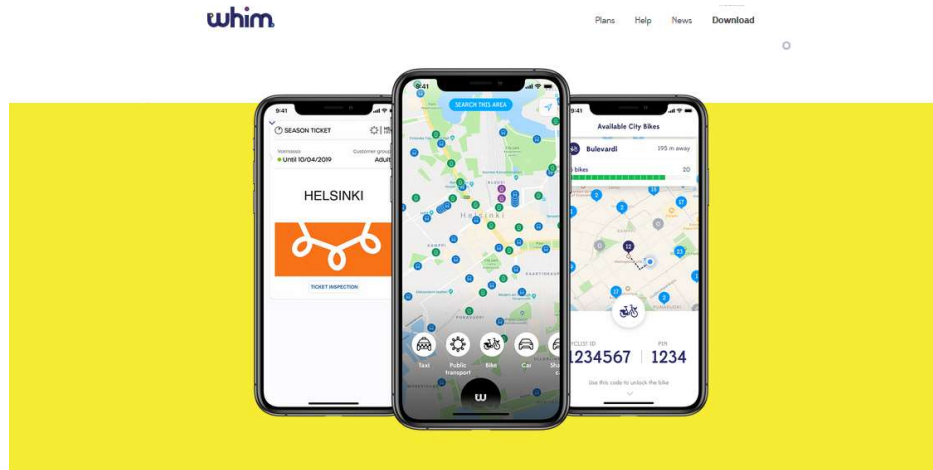

Figure 1: Whim Mobile App

Case Study: Moovel and TriMet Hop FastPass
The Tri-County Metropolitan Transportation District (TriMet) in Portland, Oregon, worked with Moovel and Google, to deliver customers the first account-based payment system on Android devices. Users can tap their phones to a fare reader to pay for trips utilising their Android Pay accounts. The card can be read by multiple different agencies; however, there are no private providers integrated on the app currently. Table 2 showing MaaS initiatives around the world.
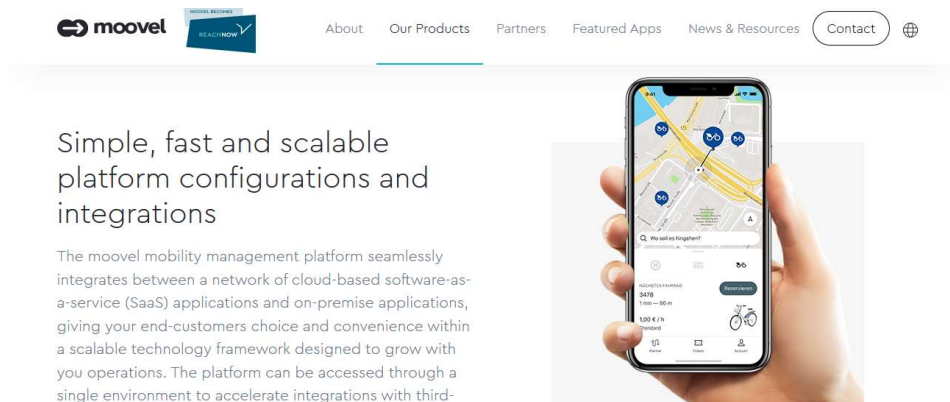

Figure 2: Mobile App for Integration

Way Forward for MaaS in Indian Cities
Following the review of international MaaS experiences, this section highlights the Indian mobility and service environment components that support a MaaS ecosystem, and evaluates the progress towards MaaS initiatives being developed across the country.
It also explores the likely market drivers and risks, and hence the potential roles and relationships the public sector will require to regulate, deliver and/or operate MaaS services in the future. This includes a summary of the enablers and challenges within government organisations, as well as market opportunities and risks.

PROJECT	DESCRIPTION	RUN BY	SCOPE
	Through its subscription-based integrated mobility app, Whim, MaaS Global offers users access to a variety of transportation options, from taxis to rental cars, public transport, and bikeshare. The app learns users' preferences and syncs with their calendars to intelligently suggest ways to get to an event.	MaaS Global	Helsinki
UbiGO	This fully integrated mobility service combines public transportation, carsharing, rental car service, taxi service, and a bicycle system—all in one app, all on one invoice, with 24/7 support and bonuses for sustainable choices.	Part of the project Go: smart by Lindholmen Science Park, with partners from industry, academia, and government, co-funded by Vinnova	80 households; approximately 200 users in the city of Gothenburg
Qixxit	With more than 21 service providers, the Qixxit app plans routes according to user needs. It offers carsharing, ridesharing, and bikesharing options; identifies ideal train connections; and shows all travel possibilities for users to compare and choose from.	Deutsche Bahn	Germany
Moovel	Enables users to search, book, and pay for rides with a single app—book and pay for car2go, mytaxi, and Deutsche Bahn in a single experience. Public transportation mobile payments are available in Stuttgart and Hamburg.	Daimler	Germany; also testing in Boston, Portland, and Helsinki
Beeline	In Singapore's first marketplace for crowdsourced bus services, users can book a seat on buses listed by private bus operators and track their location. They can also suggest new routes since new routes are activated by community demand.	Government agencies Infocomm Development Authority and Land Transport Authority in partnership with transportation operators, academia, and the private sector	Singapore
Communauto/ Bixi	In Quebec, some municipal transport authorities have offered mobility packages that include bikesharing by BIXI and carsharing provided by Communauto. For example, a user can save on the regular price of a public transport pass and bikesharing by subscribing to the BIXI-AUTO-BUS package.	Communauto	Cities in Quebec, Canada
Sources: Whim, http://whimapp.com; UbiGo, http://www.ubigo.me/; Qixxit, https://www.qixxit.de/en/; Moovel, https://moovel-group.com/en; Beeline, https://www.beeline.sg/; SMILE app, http://smile-einfachmobil.at/pilotb- etrieb_en.html; Bridj, http://www.bridj.com/welcome#how; Maria Kamargianni, Melinda Matyas, Weibo Li, and Andreas Schäfer, Feasibility study for "Mobility as a Service" concept in London, UCL Energy Institute, May 2015.			

Table 2: Illustrative MaaS Pilots Around The World

The Current MaaS Ecosystem

Whilst a few MaaS initiatives have been piloted in US & Europe and elements of MaaS have been trialled in Indian cities, most have not yet reached significant scale and/or stable business operations. Overall, substantial

MaaS experience that can be replicated across multiple jurisdictions is yet to mature. Trials are in the early stages of real-world deployment and performance, and take-up is not yet conclusive. [6]

However, the literature review and observations of international MaaS schemes, indicate that MaaS models are working best where there is an environment with:

• A wide range of transport services
• High level of customer access to digital infrastructure and personal devices
• Open and secure data access
• Available online journey planning for trips combining multimodal fixed public transport; flexible public transport; and personal services including private car trips
• Operators offering contactless payments and e-ticketing
• Jurisdictions that are open to third parties selling their services.

These requirements are relevant to transport agencies for Indian cities, so too is the identification of a service and mobility environment that will support MaaS products. [7]

Mobility Environment in Inida

The status of current mobility and service environment findings are summarised below.

Fixed Public Transport

It is very evident from the studies and surveys that public transport forms the backbone of many MaaS offerings; however, it can be more complex (and thus slower) to integrate public services into MaaS platforms, compared with private sector participants. That It is appriciated that Indian mobility environment in Metro cities including New Delhi, Mumbai, Kolkata, Chennai, Hyderabad etc is like that in other developed countries having public transport as a backbone for urban mass transportation

It is thus anticipated that there will be similar opprutnites and challenges in incorporating the public transport service into MaaS platforms, especially if the MaaS offering is not driven by the public sector.

Flexible Public Transport

Several cities in India are already expanding the traditional community transport and demand responsive services to provide flexible services using new mobility Apps and vehicles.

Personal Transport

Compared to the more traditional public transport service offerings, the shared mobility market is rapidly expanding with the proliferation of shared cabs, rideshare and car-share services.

Digital Infrastructure

The digital environment for Indian transport network is rapidly evolving – driven by digital devices' high public uptake, rising service expectations, and industry innovation. In the major cities, digital communications' coverage and quality is generally high – thus potentially supporting roadside ICT and connected ICT, and enabling digital MaaS platforms. However, low digital communications coverage and quality in some parts of rural areas is a significant barrier to providing roadside ICT infrastructure and enabling MaaS platforms outside the major urban centres.

Results and Discussion

From the study carried out it is observed that at present the transportation system in India is not integrated and people face lot of problems related to mobility. The transportation system in India needs to be modified to provide mobility to the road users through single interface of service provider. Integration of different modes can offer a tailored mobility package, like a mobile phone contact. The definition of MaaS encapsulates the ability for the service to offer any type of travel experience using any form of transport service, public or private. It is expected that innovation in MaaS will result in consumers having a wide range of mobility services as well as the choice of transport operator services that MaaS offers to the consumer.

The mobile app that combines several transport modes, including public transport, taxis, car-share and bikeshare schemes into a single monthly payment contract.

Conclusion

No full-service MaaS offering exists in Indian cities that bundles public and private transport into a subscription service.

It is apparent from the review of MaaS initiative around the globe that delivering MaaS products will be an evolutionary process shaped by market opportunities and supported by public sector vision.

It is evident from the study that MaaS does not, and will not, constitute a one-size-fits-all solution for every context. Instead, various models are likely to emerge in each country, state, city, or place – depending on their mobility and service environments.

To develop a Common MaaS model for cities it is envisaged that the public sector needs to set a clear strategic framework to have regulation at the right level and set the right policy strategy for the private sector.

References

1. Barter P., 2013, Cars are parked 95% of the time. Let's check! Reinventing Parking, Singapore, 22 February 2013, https://www.reinventingparking.org/2013/02/cars-are-parked-95-of-time-lets-check.html

2. MaaS Alliance, 2018b, Vision Paper, September 2018, ERTICO – ITS Europe, Brussels, Belgium, https://maas-alliance.eu/wpcontent/uploads/sites/7/2018/09/Vision-Paper-on-Multimodal-Passenger-   rights-240918-FINAL.pdf

3. MaaS Global, 2016, What is Mobility as a Service (MaaS)? https://maas.global/what-is-mobility-as-a-service-maas/

4. MaaSLab, 2016, MaaSLab, https://www.maaslab.org/

5. UBIGO, 2018, Allt resande i en app (All your journeys in one app), Sweden, ttps://ubigo.me/

6. MaaS: The biggest transport revolution of the 21st century, https://skedgo.com/mobility-future/what-is-mobility-as-a-service-maas/

7. What is mobility as a service? https://www.geotab.com/blog/what-is-mobility-as-a-service/