



# Research on the International Application and Countermeasures of Public Transportation of MaaS

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## Abstract

Currently, urban traffic in many countries is plagued by issues such as severe road congestion, excessive energy consumption, and heightened traffic pollution. Therefore, there is an urgent need for a new and effective solution to promote the sustainable development of urban transportation. After the concept of MaaS (Mobility as a Service, Travel as a service) was first proposed at the EU ITS Conference in 2014, MaaS became a hot topic in the field of transportation and has been widely promoted and applied in numerous cities across different countries. The proposal of the MaaS system provides the possibility to solve the aforementioned problems. As a new form of travel service, the MaaS system enhances the quality of travel by reducing passenger travel time, expanding transfer options, and improving service accessibility and diversity. MaaS will also bring about profound changes in traditional transportation services, supply and demand organization, travel behavior, and even traffic governance.

## Keywords

MaaS, urban transportation, transportation

## 1. Introduction

With the development and progress of society, as well as the continuous improvement of people's living standards, the demands for transportation have been constantly upgraded. People's transportation needs have evolved from basic requirements in the past to a focus on environmental protection and quality. Over the years, cities have actively developed rail transit, optimized bus services, and improved the environment for sustainable transportation. However, the proportion of sustainable travel and car travel has reached a relatively stable plateau, and the issue of traffic congestion has not been effectively addressed. Encouraging sustainable transportation and reducing reliance on cars have always been the approach to solving traffic problems. Over the past decade, many large cities have also implemented Transportation Demand Management (TDM) strategies to address traffic issues. However, the traditional governance methods employed have gradually become ineffective. In recent years, with China's urbanization, the central committee of the Communist Party of China and the State Council issued the Transportation Power Construction Outline in September 2019. This outline proposed the construction of urban public transport facilities and emphasized the need to strengthen the cohesion between urban rail transit and other modes of transportation. It also introduced the concept of "travel as a service" (abbreviated as MaaS) for the first time. As a new people-centered transportation concept, "MaaS is the integration of various forms of transportation services into a single on-demand transportation service, including public transportation, ride-sharing, car-sharing, bike-sharing, taxi or car rental, or a combination of any of these [1]. It can be seen that by integrating various modes of transportation to provide one-stop and customized transportation services to travelers, MaaS provides a new approach to streamline the interaction among multiple stakeholders in the complex urban transportation system and explore a more refined governance path.

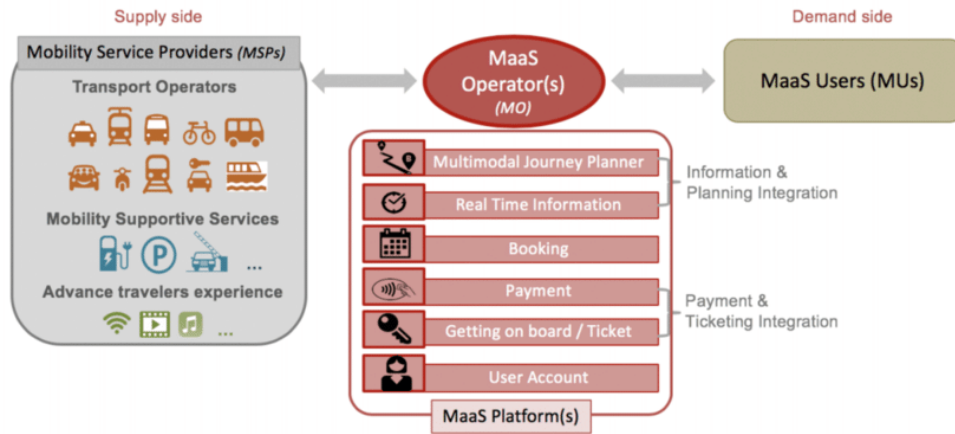


Figure 1. The MaaS concept (Kamargianni et al. 2018).

## 2. Advances in international research achievements on MaaS

Concept and application include: Raphael et al. outlined several key conceptual issues such as the service nature of MaaS, interactive logic, user cognition, and sustainability [2]. Florin et al. [3], Corinne et al. [4], and Karlsson [5] respectively studied the logical relationship, mutual effect, and main factors between MaaS and the urban traffic system and external traffic system. Peraphan et al. [6], Roni et al. [7], and Rikka et al. [8] proposed the concept of MaaS, core characteristics, research status, and focus, collecting core elements through literature review [9]. Based on the concept and service features of MaaS, Glenn et al. [10] discussed the social and technical ideas of MaaS from the perspective of users. Mulley and Nelson [11] argue that MaaS can revolutionize the effective way of public transport in the European market and reduce the density of each vehicle on the streets of European cities. Yue Jintao [12] followed the logical sequence of "product-travel chain-area" in the development stage of MaaS. Kate [13] conducted a critical analysis of MaaS for the first time and proposed the associated risks. Liu Xianglong [14] conducted research on the construction of a standard system for Chinese city travel services (MaaS), promoting collaborative drafting of key standards for political production. Visible, the existing research results generally suggest that MaaS (Mobile as a Service) focuses on people or goods as the core, with the goal of meeting the demand at all levels. It aims to integrate and optimize various modes of transportation, covering all aspects of transportation. Additionally, it aims to provide customized services based on the specific requirements of travelers. This approach is beneficial in forming a new and effective traffic management strategy. Fig. 2 provides an overview of MaaS functionalities [15].

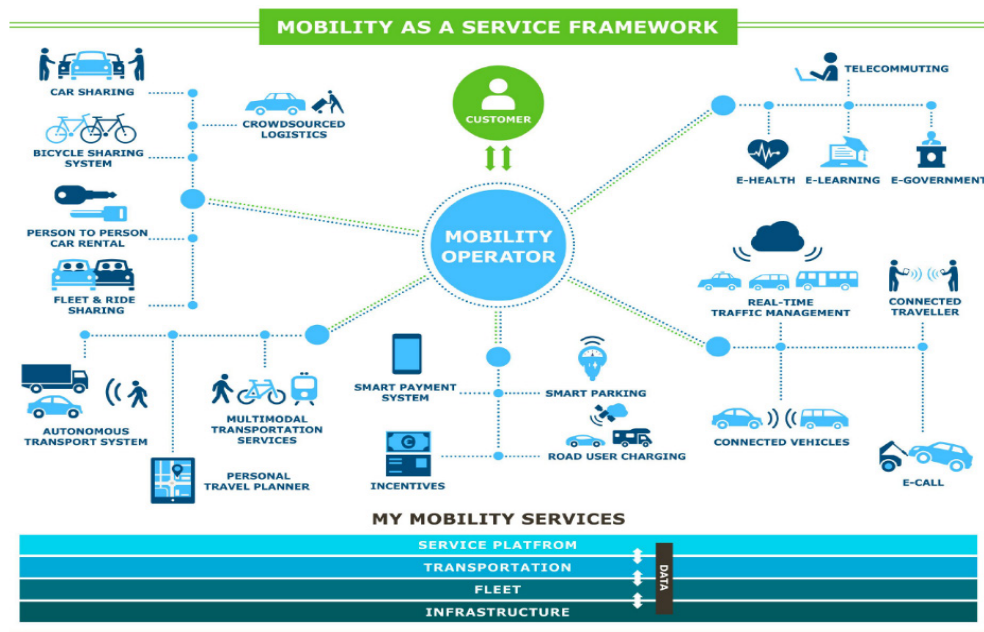


Figure 2. General overview of the Mobility-as-a-Service (MaaS) concept.

### 3. International practical experience

#### 3.1 The UbiGo case in Gothenburg

Sweden in April 2019, UbiGo was officially launched in Stockholm, offering four modes of transportation and four monthly service packages. This allows users to choose and recharge as needed. The program provides options for public transport, taxi services, car rentals, and car-sharing programs for residents of participating communities. The service will be thoroughly evaluated. The goal of the project is to promote more sustainable methods of travel by demonstrating new business models that can reduce the demand for private cars through the provision of "mobility services." As a leader in the Mobility as a Service (MaaS) industry, UbiGo offers comprehensive daily travel services in the city. We have taken inspiration from the monthly rent model used in the telecom industry and applied it to the travel industry. Our goal is to provide users with a convenient and seamless one-stop travel experience.

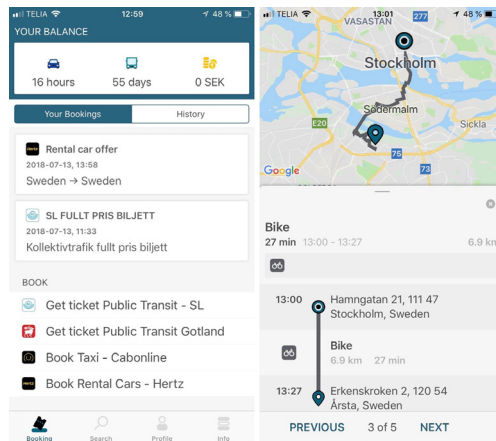


Figure 3. UbiGo interface [16].

#### 3.2 HM, Helsinki

In Finland in 2015, MaaS Global, an operator jointly established by several Finnish transportation organizations, was founded. The municipal government of Helsinki, the capital of Finland, launched Whim in late 2016 through a partnership with MaaS Global Company. In early 2017, Whim completed beta testing and was launched in Helsinki. The Whim platform builds a MaaS ecosystem, which consists of Chinese transportation providers, data providers, and foreign service providers. This ecosystem enables the realization of one-stop travel services. The primary goal of Whim's promotion is to offer users an affordable, convenient, and environmentally-friendly travel package service that is distinct from private cars. This service aims to not only fulfill users' daily travel requirements but also significantly enhance their travel experience. Additionally, it aims to improve users' financial situation and motivate them to reduce their reliance on private cars by reducing the associated costs.

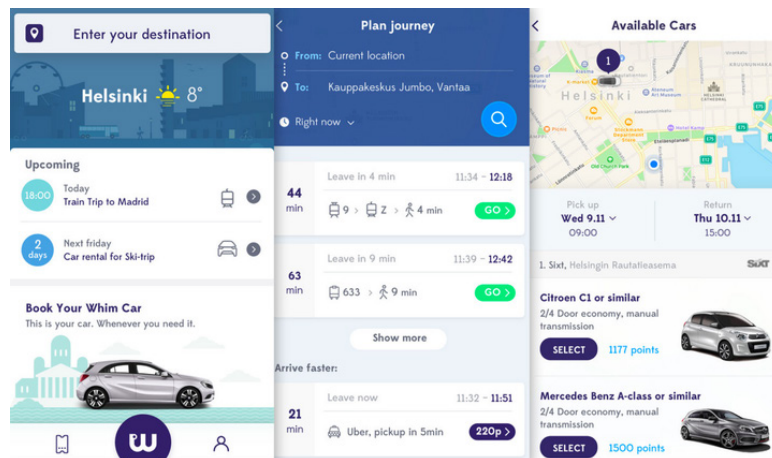


Figure 4. Whim interface (36 Kr).

### 3.3 The "Xiongan Tour" in Beijing's

Xiongan New Area in May 2020 set up a variety of transportation modes through the integration of the "Male Ann" app for online commissioning. Initially, the focus is on official cars and enterprise transport services. Subsequently, the app will gradually provide shuttle car services, including alignment shuttle cars and elastic shuttle cars. It will also offer official and CEC parking service booking and payment options to meet the transportation security and operational assessment needs of the eastern area. Additionally, it will cater to the official car booking and regulatory service requirements of the Male Ann group. This initiative aims to establish a comprehensive "one-stop" smart travel system. After the launch of the "Xiongan Travel" smart travel system, specific and positive effects can be observed through its operation. It can effectively enhance the accessibility of intelligent travel in the high-tech zone and improve the efficiency of travelers in this region.

### 3.4 Kaohsiung MenGo

The platform was officially launched in Kaohsiung, Taiwan province in 2018. It provides citizens with planning, navigation, information inquiry, and ticketing services for eight modes of transportation, with rail as the core. For rail transit (including Kaohsiung MRT and light rail), Men Go provides information and payment services for four travel modes. This allows users to plan their travel routes using any of the mentioned modes of transportation. Additionally, Men Go offers package ticket services that include both MRT and light rail travel options. While enhancing road safety, it also increases the utilization rate of public transportation and effectively promotes the development of local sustainable travel.

### 3.5 Shanghai with the bid

In October 2022, under the leadership of the Shanghai Municipal government and the Shanghai state-owned enterprises, four travel modes are provided for citizens: bus, subway, taxi, and driving. This includes planning, payment, and booking services, as well as the introduction of game-style green points to encourage citizens to choose environmentally-friendly transportation options.

### 3.6 Guangzhou Yangchengtong

Yangchengtong was launched in Guangzhou in 2018 and is operated by Guangzhou Yangchengtong Co., Ltd., a joint venture between Guangzhou Public Transportation Group Co., Ltd. and Guangzhou Metro Group Co., Ltd. Yangchengtong provides nine modes of transportation for citizens, and as of 2019, over 20 million QR codes had been registered. At present, the Guangzhou municipal government is currently focusing on optimizing and integrating data from various modes of transportation. The goal is to launch improved travel services that can better serve the travel needs of Guangzhou citizens.

## 4. Urban public transport development strategy under the MaaS concept

International practical experience shows that MaaS (Mobility as a Service) is not only a new travel service concept but also a new travel service ecosystem in the context of digitalization. Its purpose is to develop a multi-modal and collaborative integrated travel service system. The core of the MaaS system is to achieve the integration of various resources, such as transportation capacity, data, ticketing, payment, assessment, etc. Urban public transport plays a crucial role in the MaaS system [17]. To promote the high-quality development of urban public transport in China, improve the efficiency of transportation resources utilization, and alleviate urban traffic congestion, the following development strategies are proposed based on the concept of Mobility as a Service (MaaS).

### 4.1 Accelerate the construction of the "three complete" basic information network of urban transportation Digital

Intelligent development is the foundation of traffic fine management. It aims to promote digital transformation and enable online operations, management, and services for various resources, elements, and business processes. This approach covers the entire transportation field, including the "whole way, total elements, and whole life cycle" of information, ensuring comprehensive coverage.

### 4.2 Accelerate the launch of differentiated travel service models

MaaS needs to provide targeted and differentiated travel services for various groups and during different time periods. Different groups have varying travel preferences regarding time, ticket price, and payment willingness. Therefore, it is necessary to offer tailored and high-quality services that consider factors such as time, ticket price, comfort, and rationality.

This approach aims to maximize passenger satisfaction and optimize the efficiency of transportation resources.

### 4.3 Develop data-driven decision-making and optimization

In the era of digital transportation, urban public transportation systems need to prioritize data as the key element and core driver. They should utilize big data and intelligent technology to collect, analyze, and predict travel demand, traffic flow, and service levels. This will facilitate the seamless integration and interaction of transportation activities across various business scenarios, ultimately enhancing the overall service level.

### 4.4 Scientific construction of urban transportation service platform

To enhance the safety and efficiency of passenger and freight transportation services, we are committed to developing a MaaS travel service platform that encompasses all aspects of travel planning, travel services, travel feedback, and value-added services. Our objective is to enhance the quality and efficiency of data-driven information sharing, promote environmentally friendly and low-carbon travel, and provide integrated travel services. Build a MaaS operational service platform that encompasses all aspects, including demand forecasting, operational scheduling, safety production, and TOD (Transit-Oriented Development). This platform aims to enhance the quality and efficiency of data-driven transportation system integration, improve travel service quality, and promote sustainable development within the transportation industry.

### 4.5 Reasonably formulate the urban public transport ticket system and fare system

According to the transportation demand and service level of different regions of the city, a multi-level public transport fare system structure is established, and regional graded fares are set. By making flexible preferential ticket systems adjust travelers' travel time, and travel mode, optimize the passenger flow distribution, balance traffic resources, and effectively meet the needs of different travelers, more crowded or better areas can set slightly higher fares, and more remote or poor service area can set lower fares, to ensure that different modes of public transport have consistent fare standard, by providing preferential fares and incentives, encourage passengers to choose a sustainable mode of transportation.

### 4.6 Establish a user participation and feedback mechanism

Taking users' rights, interests, and service experience as the starting point, we will conduct regular user surveys and questionnaires to understand their satisfaction, questions, and suggestions regarding public transportation services. This was implemented through online survey tools, paper questionnaires, or face-to-face surveys at stations and on vehicles: Organize user feedback, opinions, and needs in real-time, and implement corresponding improvement measures; Enhance users' sense of participation and experience, improve the quality of public transportation services, and increase user satisfaction; To continuously enhance people's travel experience and increase the brand value, as well as the social and economic benefits of public transport services.

## 5. Summary

The continuous increase in urban traffic in China makes it inevitable that the traffic management of major cities will evolve towards greater refinement. The concept of MaaS brings new ideas to the efficient management of urban traffic. This paper summarizes the current development of MaaS and provides examples of successful international experiences. It also proposes the concept of a MaaS urban public transport development strategy, to establish a solid foundation for the advancement of urban public travel services. At present, MaaS is conducting scientific research and exploring its application in major cities and regions in China. With the public's increasing understanding and willingness to embrace change, the concept of MaaS will undoubtedly play a crucial role in enhancing the efficiency and effectiveness of urban public transportation in China.

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