

# Opportunities and Challenges of MaaS' Development in China Under the Background of Metropolitanization

Guixi Zhang<sup>1, a\*</sup> and Qingrong Zeng<sup>2, b</sup>

<sup>1</sup>Beijing jiaotong university, haidian district, Beijing

<sup>2</sup>Beijing jiaotong university, haidian district, Beijing

<sup>a</sup>18120735@bjtu.edu.cn, <sup>b</sup>18120734@bjtu.edu.cn

\*Guixi Zhang

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**Abstract.** With the development of economy and the improvement of living standards, people have higher requirements on travel services, not only for basic displacement activities, but also for better travel experience. In urban travel activities, people pay more and more attention to instant and comfort travel. The rapid development of modern information technology has promoted the concept of Mobility as a Service (MaaS), laying a theoretical foundation for the realization of higher-level travel demand. Under the "metropolitanization", the population continues to gather in large cities and urban agglomeration, supporting more developed transportation industry, creating a good business environment for the development of MaaS, but at the same time making urban traffic more crowded, and the shortage of transportation resources is also a challenge for MaaS development process. The article analyzes the opportunities and challenges of MaaS development in China from the perspective of various stakeholders under the background of "Metropolitanization".

## Introduction

Since the founding of New China, China's urbanization rate has increased from 10.64 percentage in 1949 to 59.58 percentage in 2018, an average annual increase of 0.71 percentage points. By the end of 2018, China's urbanization rate has exceeded 4.29 percentage points of the world urbanization average. In August 2019, the fifth meeting of the Central Committee of the Fiscal Economy officially proposed to enhance the economic and population carrying capacity of economic development areas such as central cities and urban agglomerations. As a basic, leading and strategic industry in the national economy, the transportation industry is an important service industry. In the "13th Five-Year Plan" modern comprehensive transportation system development plan, it is proposed to comprehensively deepen the transportation reform, actively expand new modes of transportation and new fields, promote the green development of transportation, and improve the intelligent level of transportation development. Under the background of "Internet+", the transportation service model has been continuously upgraded, and the rapid development of mobile communication technology has promoted the interconnection of data and information, providing a solid foundation for people to customize their own unique travel plans. Under the background of Metropolitanization, the demand for urban transportation is higher. The development of MaaS provides opportunities for the harmonious and orderly development of urban transportation and the high-quality travel of residents. Therefore, it is of great practical significance to study the opportunities and challenges of MaaS development in China under the background of MaaS urbanization.

## Background

Mobility-as-a-service (MaaS) was first proposed in Finland in the year of 2014. It is a way to transform the mode of travel based on private car ownership into a mode of transportation based on the right to use, while changing the relationship of individual travellers' modes of transportation. That is to turn the individual-owned vehicles into traffic as a service, to provide users with consumption, truly seamless connection, saving cost of living. The core of MaaS is to provide platform components

and tools for the interaction between users and suppliers [1]. MaaS puts users at the heart of travel services and provides them with tailor-made travel solutions based on individual needs. This article focuses on using MaaS to achieve personal accessibility in big cities. First of all, it is recognized that MaaS is characterized by door-to-door convenience, seamlessness, integration, multi-modal travel and ease of payment [2]. Internet travel services first use information technology to support high-efficiency supply and demand time-space matching in the quasi-public transportation field, to meet decentralized traffic demand, to improve user accessibility experience, and to facilitate travellers in a market-oriented and privatized manner, realizing the integration and utilization of transportation resources [3].

The key to seamless communication of urban traffic is the improvement of matching efficiency: taxis have no-load cost, search cost and waiting cost. Passengers also have search costs and waiting costs. Supply and demand are mismatched, which also gives birth to car-hailing app. The ultimate goal of urban transportation development is to achieve high efficiency of individual accessibility. Better travel experience will become the market development goal of each app. The travel service under the background of "Internet +" has a more distinct tendency of individualization. Each travel app pays more attention to satisfying the differentiated needs of individual users and improve the travel experience of individual customers. The key is to grasp the habits of users. The grasp of travel habits needs to be realized by big data. By grasping the different requirements of users on travel modes and travel time, mobile service providers can integrate various types of transportation resources to provide users with truly seamless and door-to-door travel services. This kind of travel service is called MaaS.

MaaS effectively matches the user's travel data, and achieves an accurate match between the supply and demand sides through a simple process of collecting data, organizing data, and using the data. The data collected here is mainly for multi-dimensional data collected by the daily service users of the platform. The integration, including the individual user's preferred travel mode, travel time and the frequency of using the relevant App, and then through the relevant algorithms to achieve the integration of data, and finally apply the data to the service customer, to achieve "from the customer, Go to the customer". The good use of data enables the resources to be better optimized and configured, and the complete transport chain has no time-interval transport service, which promotes the improvement of matching efficiency.

### **Relationship between Metropolitanization and MaaS**

The rapid development of urbanization is accompanied by the expansion of urban scale and the rapid increase of urban population. Urban public transportation is an important part of the comprehensive function of the city, and it plays an important role in maintaining the harmonious and orderly development of the city. In some cities with rapid urbanization, the level of urban public transportation services often cannot meet the needs of transportation [4]. It is believed that the construction of transportation infrastructure is an important aspect affecting the development of urbanization. The development of urbanization needs to be supported by the construction of transportation infrastructure. The population intensive in the big city and the industrial intensive phenomenon need more perfect transportation infrastructure construction. Under the new development background, analyzing the impact of the development of transportation on metropolitanization is of great significance for the large-scale advancement of urbanization in China in the future, promoting urban modernization, intelligent development and improving the quality and level of urbanization [5].

In studying the relationship between economic growth, urbanization and metropolitanization, metropolitanization is the main driving force for economic growth, but the excessive development of large cities is not conducive to the improvement of urbanization. Because the over-development of big cities often leads to urban problems such as traffic congestion, serious pollution and criminal growth. In order to solve the negative traffic impacts that metropolitanization may bring, the development of MaaS should be promoted [6].

From the stage, the domestic research on MaaS is still in its infancy, and there are not many studies. From the perspective of development prospects, there are scholars who summarized the existing MaaS service cases, analyzed the application characteristics of MaaS, the application characteristics of MaaS, and the application prospect of MaaS in China, concluded that the generation of MaaS services not only provide convenience for travelers, but also has positive significance for the government. But the vision of sustainable development of the planning and management of the need to develop reasonable scheme and traveler needs cooperation between service providers and the government [7]. MaaS has extensive market prospect in our country, but is still faced with many challenges, including policies, systems and mechanisms, credit system, standard specification, information security, performance evaluation, and development path, overcoming these challenges require various stakeholders [8]. From the perspective of solving urban problems, domestic cities are similar to foreign cities in that they are also faced with such problems as traffic congestion, urban environmental pollution and increasing aging. With the widespread popularity of smart phones and mobile payments in China, MaaS can provide corresponding solutions for cities [9]. The prospect of MaaS is attractive to proponents, with the opportunity to offer truly compelling alternatives to private cars, but there is a specific conflict between the goal of reducing car use and the pursuit of profits from mobile intermediaries that share or rent cars rather than use public transport.

## **The Opportunities and Challenges of MaaS under Metropolitanization**

### **Development Opportunities**

The Metropolitanization brought more people and industries, which provided an opportunity for the development of MaaS. In addition, the rapid advancement of large urbanization has brought about various urban problems. Traffic congestion is one of the problems that cannot be ignored. Under the impetus of metropolitanization, the development of MaaS will be greatly accelerated. In order to alleviate urban traffic congestion and other issues, the government may introduce relevant policies to promote new circulation between providers and demanders of transportation services in cities. The premise of MaaS system operation is the complete grasp of information, on the one hand, the travel required to provide services to users. The information needs to include the running speed, available time and running cost of the transportation mode provided by the provider of various modes of transportation. The information to be obtained on the user side includes the user's travel preference, the ideal price for the whole set of transportation modes, and the target travel. Time, etc., to establish a system that fully utilizes idle resources on the basis of personal interests.

After fully integrating the information of travellers and travel service providers, MaaS can provide real-time, comprehensive and authoritative traffic information services for travelers. Let the public arrange the travel time reasonably; at the same time, travel service provision It can also quickly and timely receive the needs of travellers and respond quickly, which saves the time cost of urban traffic travelers, including the waiting cost of travellers, search costs, etc.; MaaS system can truly satisfy the users in the city. Increased degree, improve the comfort, reliability, economy, accessibility, etc. of the travel process. At the same time, the rapid development of metropolitanization also means the rapid increase of the number of Internet users in the city. According to the data of China Internet Network Information Center, the deadline By June 2019, the number of Internet users in China has reached 854 million, and the Internet penetration rate has reached 61.2%. The development of the network will enable MaaS to collect data, share data and use data better.

The development of Metropolitanization further promotes the concentration of industries and people, and therefore further increases the requirements for the quality and scale of transportation infrastructure. Through improving the construction of urban transportation infrastructure by the government can effectively improve the accessibility of residents, expand the scope of travel, and further expand the scope of urbanization. The improvement of transportation infrastructure is the precondition for the development of MaaS. MaaS requires the unification and smoothness of the entire transportation system. The improvement of transportation infrastructure is the prerequisite for the establishment of a comprehensive urban transportation system. By reducing travel costs and

improving accessibility, population More flocking to the city, more economic activities are implemented in the city.

Metropolitanization also creates more profit opportunities for software service providers. The Baidu map and Gaode map that have been launched can be regarded as a prototype of the MaaS system. You can get the approximate time by entering the starting point and destination, and also provide users with different routes. Taking Baidu map as an example, it includes five modes of travel, the bus includes the best travel plan, the least transfer plan and the least walking plan. Baidu has its own taxi business, so Baidu map can also take a taxi and provide the nearest driver to arrive, also provides users with tolls, traffic lights, etc. However, because Baidu itself has Baidu car service, these five programs will indicate the amount of money required for taxis below. In summary, it can be seen that the travel APP in the form of Baidu map has already had the prototype of MaaS in the construction idea. Although the approximate travel time of the whole process is given, there is an error in the accuracy, and it cannot count as an integration of various transportation methods.

### **Development Challenges**

The advantages brought by metropolitanization can also be its shortcomings. At the beginning of MaaS' development, it may not be able to withstand the excessive population and vehicles brought by rapid urbanization, if not properly coordinated, the result can be counterproductive.

In terms of excess population, in the process of urbanization, the distribution of transportation resources is often unfair, the population is too large and the transportation resources are too small. The travel demand between different travel groups in the city is different from the expected travel cost. The urbanization of the city has made the population of the city diversified. It poses a higher challenge to the fairness of travel to be achieved by MaaS. It also avoids the emergence of vulnerable urban traffic groups. More people brought by the metropolitanization make the city Space continues to expand to the suburbs. Some low-income groups will also migrate to the suburbs due to the expensive housing prices in the city center. At this time, the travel distance becomes longer and the travel difficulty becomes greater. Considering the different travel groups' requirements for travel prices and travel modes, MaaS needs to collect information on different travel groups and develop differentiated travel plans.

On the other hand, too many vehicles will aggravate road congestion and air pollution, and will also affect existing transportation infrastructure, such as insufficient parking spaces, occupation of public transportation vehicles and non-motorized travel spaces. Under the green concept, the development of transportation in the process of Metropolitanization should still be based on public transportation. Under the concept of green development, the development of large-scale urbanization still needs to be based on public transportation. On the other hand, excessive vehicles will increase road congestion and air pollution, and will also affect existing transportation infrastructure. For example, parking spaces are insufficient, crowding public transportation vehicles, and crowding out non-motorized vehicle travel spaces. Under the development concept, the development of large-scale urbanization still needs to be based on public transportation. In fact, a well-established MaaS system can reasonably coordinate the existing transportation infrastructure and vehicle relationships to create a harmonious urban transportation system. But in addition to the existing transportation infrastructure, MaaS also needs to properly plan the future construction of transportation infrastructure in the city. MaaS is future-oriented and can continue to contribute to the great urbanization process. This requires cooperation from users, government departments and urban transportation travel service providers, through a comprehensive travel service operators, the operators needs to be the intermediary between users and various transportation provider, by building a APP which users can easily use to implement a key to complete the whole process of travel services, to meet the needs of people of different cultures. Similarly, payment is only made through APP, which requires the data of mobile payment providers. The core of Maas is to provide users with simple and convenient services, and put forward high requirements for intermediary operators. Intermediary operators should play a coordinating role, obtain the required information from the supply and demand sides and deploy them. The plan is

adjusted in a timely manner to ensure that the user gets a satisfactory travel experience rather than completing the travel plan.

All in all, the agglomeration of population and industry brought about by Metropolitanization and the increase in economic activities make MaaS face huge opportunities. At the same time, it is also necessary to consider all possible problems. It requires not only the cooperation of various stakeholders, but more importantly, grasp the characteristics of travellers in the cooperation of various stakeholders and solve the challenges of foreseeable and unanticipated urbanization.

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