Towards the development of innovative technologies for the «Mobility as a Service» system

Tatyana Sakulyeva
State University of Management, Moscow, Russia

E-mail: sakulyeva_tn@mail.ru

Abstract. One of the main conditions for the successful operation of the Mobility as a Service system is the ability of smartphones to access various modes of transport. For the first time, the «Mobility as a Service» concept was implemented in the Swedish city of Gothenburg, offering excellent public transport conditions and sustainable urban mobility. The purpose of the transport policy is to support the transport system, which ensures the movement of passengers and goods. «Mobility as a Service» is seen as a tool enhancing travel comfort and developing a safe and reliable transportation system. Public transport is the core of the «Mobility as a Service» system. In connection with the development of the «Mobility as a Service» system, the transport policy of many countries needs to adjust its course so that the development of mobility motivates the use of public transport services and active means of transportation.

1. Introduction
The Mobility as a Service system assumes that a person can use different types of transport while traveling. Digital technologies made it possible to take a slightly different look at the current situation [1]. One of the main conditions for the successful operation of «Mobility as a Service» is the ability of smartphones to access various modes of transport. This means that operators of various modes of transport must support various forms of electronic ticket or electronic payment [2].

2. Issues and problems of the «Mobility as a Service» system development
Despite successful implementation projects and positive feedback from users about «Mobility as a Service» pilot projects, there are a number of global questions about the further applicability and development of the system:

- the question regarding the transparency of data from carriers and users;
- the question of the scale of the «Mobility as a Service» system use;
- the issue of a single user ID, a single information space;
- the issue of payment for the passage of various transport systems from one application;
- competition with existing providers;
- private property issue.

Traditionally, the provision of travel information is the responsibility of the transport operator. Many of them decided to open their data so that developers could implement information services. Data transmitted by public transport, open to developers, has a huge impact on the development of the
«Mobility as a Service» system. An open data policy can be a catalyst for implementing «Mobility as a Service». Many public transport operators have already opened access to their data in real time, but such an initiative is not widespread.

The «Mobility as a Service» system may face strong competitors who already have global services, such as famous Uber app and eCab taxi app. eCab application, which offers taxi reservation and payment services, uses one separate account in six European countries, as well as in India, Canada and Lebanon. The «Mobility as a Service» system will have to work with them, but not try to integrate individual companies again. The question remains unclear whether the suppliers themselves are ready to integrate their platforms with «Mobility as a Service». Most likely this will happen if «Mobility as a Service» becomes the main travel application. The conditions for implementing the «Mobility as a Service» system are presented in figure 1.

![Flowchart](image)

**Figure 1.** «Mobility as a Service» System implementation terms.

Over the years, various government efforts and research projects have been carried out to unify the format of public transport data. Despite the efforts, public transport companies still did not want to abandon their own data formats. However, when Google Transit became widely available, many
volunteered to submit their data in accordance with the Google Transit data format. Firstly, it has become possible because carriers want their services to be included in Google maps and navigation services, which occupy a leading position worldwide. Secondly, because the Google Transit APIs, the general transit schedule feed specification description format (GTFS and GTFS real time formats) are simple and user-friendly. One can take advantage of the Google Transit experience and start developing APIs so that individual operators can simply and easily join «Mobility as a Service». This will require predefined data formats and a quality control mechanism. «Mobility as a Service» is currently working on an open, standard system architecture. However, data format and quality control issues have not yet been resolved. Data quality is more important for «Mobility as a Service», as it will have a direct impact on customer opinion. Unlike Google Transit, which is free for users, «Mobility as a Service» must guarantee the quality of information in order to create and maintain customer trust [2].

The following issues may hinder the development of the «Mobility as a Service» system:

- on the part of users, the lack of a system for protecting client rights within the user base may limit understanding of the alleged value of «Mobility as a Service», and, therefore, the social benefits of «Mobility as a Service»;
- on the part of the «Mobility as a Service» provider, authorities need to maintain control of the «Mobility as a Service» market. This can be achieved by monitoring the operations of «Mobility as a Service» providers in order to eliminate market failures if they occur in the future;
- from the data provider «Mobility as a Service» is activated by transferring data between system intermediaries. Data providers should be given this opportunity by connecting transport operators with «Mobility as a Service» providers - interoperability is key;
- from the side of the transport operator «Mobility as a Service» will change the business model of transport operators in the future. Lack of desire on the part of transport operators to interact with the «Mobility as a Service» system may restrain its growth.

3. «Mobility as a Service» system and politics

The development of «Mobility as a Service» will be driven by the overall technological development in the field of transport. How fast and successfully digital traffic management platforms will be implemented, the speed of the appearance of unmanned vehicles, the availability of a competent information policy will determine the role of «Mobility as a Service» in the future transport system of cities. Creation of a legislative framework for the functioning of «Mobility as a Service» is equally important.

In accordance with the policy, regional and local authorities have the opportunity to introduce innovations in the field of «Mobility as a Service», which may be an advantage of local politics [3, 4]. A number of authorities in the UK are already starting to implement «Mobility as a Service», conducting test events through innovative financing programs. These initial steps are important and help you see how policy changes can support «Mobility as a Service» growth.

With the help of road construction organizations, several areas have been identified in which «Mobility as a Service» contributes to various policy areas:

- development planning through the ability of «Mobility as a Service» to reduce traffic flow during the development of the transport network;
- social cohesion because «Mobility as a Service» contributes to the development of a shared consumption economy, especially rider sharing and car sharing;
- work in partnership: the ability of «Mobility as a Service» to create new opportunities for government representatives to work with the supply chain;
- traffic management: the ability to create a regulated market for the distribution of road space for «Mobility as a Service» suppliers that most meet the requirements of authorities.
So that «Mobility as a Service» can function properly, a centre must be created to manage all traffic flows. Management will be based on predictive transport models that predict the situation for the short term. Their main difference from the existing ones is the recording of not only historical data, but also incoming travel applications from users. Processing all incoming applications, the model will perform calculations and, taking into account the requirements for achieving a system optimum, build a tariff policy for the use of various services. In a number of critical cases, it may be possible to prohibit the use of any type of transport, however, in any case, it will be necessary to provide for the possibility of communication with the operator.

Each user will have the opportunity to install a special application on the smartphone, with which one can quickly select the type of transport that he prefers, and at the same time, a single system will receive information about planned movements and pre-calculate various traffic flow management scenarios to ensure sustainable and uptime [5, 6]. Thus, an ordinary purchase will turn into some purchase allowance on aggregator sites - a list of options with prices will appear in front of you, and the only thing that needs to be done is to confirm your choice. The main advantage for the user will be the predictability of travel time.

4. Conclusion
At the moment, users, public institutions and state authorities are not yet ready for the widespread adoption of «Mobility as a Service» [7]. It is necessary to overcome a number of technical, ideological and legal difficulties. A wide range of issues has now been identified that need to be addressed both at the regional and national levels:

- Will the Open Data principles in the «Mobility as a Service» system be supported in the future?
- Will «Mobility as a Service» be used to optimize investment in transport systems?
- How will low-emission car policies affect «Mobility as a Service»?
- Will «Mobility as a Service» projects be supported through funding?
- Will a public transport franchise strategy support «Mobility as a Service»?

The «Mobility as a Service» system is one of the most satisfactory options for the development of transport in cities; it is necessary to systematically move in this direction.

References
[1] Ogorodnikov P I, Tasmaganbetov A B and Tyapukhin A P 2019 On typology of the new economy E-Management 2(1) 60-77
[2] Sakulyeva T N 2018 The «Mobility as a Service» system and its problems E-Management 2 30-7
[3] Hensher D A 2016 Future bus transport contracts under mobility as a service regime in the digital age: are they likely to change? (Australia: Sydney)
[4] Li Y 2015 Where to Find Mobility Related Apps: Designing an App Directory for Mobility service Proceeding 22nd World Congress on Intelligent Transport Systems (Boudreaux, 5-9 October 2015)
[5] 2020 Midlands Connect explores, develops and recommends transport projects which will provide the biggest possible economic and social benefits for the Midlands and the rest of the UK Retrieved from https://www.midlandsconnect.uk
[6] Sakulyeva T 2018 Megapolis public transport system International Journal of Civil Engineering and Technology 9 647–58
[7] Yanying L and Voege T 2017 Mobility as a service («Mobility as a Service»): Challenges of Implementation and Policy Required Journal of Transportation Technologies 7 95-106