

Digitalized urban transport system in small cities

<https://doi.org/10.31713/MCIT.2025.033>

Konul Samadova
State University Mingechevir
Mingechevir, Azerbaijan
konul.zabitqizi.i@gmail.com

Abstract — Small cities face growing transport challenges due to urbanization and increasing mobility demands. Limited infrastructure and resource often hinder efficient transport management. Digitalization offers opportunities to enhance mobility, optimize routes, and improve commuter status faction.

INTRODUCTION

Transportation digitalization is the process of using digital technologies to improve the operations, services and products of a transportation organization. In the automotive industry, digitalization has had a positive impact on safety, efficiency and cost reduction.

The transport system plays a crucial role. The economic and social health of an urban area depends to a large extent on the performance of its transport system. “The transport system not only provides the means for the mobility of people and goods, but also influences growth patterns and the level of economic activity over time through the accessibility it provides to land. The people who use the urban transport system every day partly determine how successful a transport plan really is. In addition, a successful transport plan should be attractive to customers who no longer use the public transport system and should discourage potential customers from private transport.

II. OBJECTIVE

This study investigates the implementation of digitalized urban transport systems in small cities, highlighting potential benefits, challenges and strategies for effective adoption.

Improving efficiency and passenger satisfaction in urban transport is one of the main priorities of modern urbanization processes. The shortcomings of traditional ticketing systems—such as the inability to accurately predict delays, long waiting times, high management costs, and limited accessibility for users—create the need for innovation in this area. The article discusses a project aimed at digitalizing urban transport. The project is designed to improve the quality of public transport services through real-time route tracking, electronic ticket purchasing, and digital data analytics. It is intended to be implemented in the city of Mingechevir,

Azerbaijan. Approaches to digitalizing urban transport vary worldwide. Successful models include transport system networks established in countries such as Austria, the UK, and Denmark. Austria’s Wiener Linien can be considered one of the most successful examples.

Implementing such projects in small cities provides many practical and strategic advantages. Compared to large metropolises, intervals between trips may be longer in smaller cities; purchasing electronic tickets can reduce printing costs, the need for inspectors, and additional cashiers. The use of large buses to transport residents can enhance both safety and transparency, strengthening trust among citizens as well as tourists. This system will also enable visitors (tourists) to plan their routes to city attractions in advance and arrive at specific locations at the exact scheduled time.

The startup project aims to increase the efficiency of urban transport by developing a user-oriented mobile application and server infrastructure. The project targets real-time route planning of ground transport vehicles (intra-city buses, trams, metro, as well as intercity transport), as well as improving and updating passenger experience through electronic tickets and user data analytics. The technical implementation will be built on OpenStreetMap, GTFS/GTFS-realtime (GTFS – General Transit Feed Specification is an open

standard used by public transport agencies to share information about routes, schedules, stops, and geographic data), routing engines (OSRM/GraphHopper), and modern mobile cloud architecture. The project will be evaluated using metrics that demonstrate reduced average waiting time, more efficient use of passenger time, increased user satisfaction, and reduced operational costs.

III. CREATION SYSTEM

Key considerations in creating the system:

- Collecting existing transport data in a structured way and creating data flows compatible with GTFS/GTFS-realtime;
- Developing a user-friendly mobile app with multimodal route planning;

Modeling, control and information technologies – 2025

- Building a monitoring and alert system for real-time positions and delays;

- Implementing an electronic ticketing system (QR/token), payment integration, and validation mechanisms;

Measuring system impact through pilot testing—waiting time, on-time arrival rate, user satisfaction.

MVP (Minimum Viable Product) functionalities of the project:

- User registration
- Route planner
- Real-time arrival information
- Static schedules and stop search
- Electronic tickets (purchase and validation)
- Delay and movement notifications (push notifications)
- Admin panel – live map monitoring + basic analytics for operators

OpenStreetMap can be used (to identify stops and define the road network), and GPS devices should be installed in vehicles for project implementation. For accessibility and passenger comfort monitors should also be installed in vehicles to display real time route maps.

The startup project can generate revenue through

ticket commissions, subscription services, and advertising placements.

This project aims to improve the urban transport system, reduce environmental pollution through increased use of public transport, and lower citizens' transportation costs. In this system, special discounted cards can be created for students, seniors, and socially

disadvantaged groups. As in global practice, citizens can also be provided with annual, quarterly, or monthly

special cards. Wider use of public transport will also help reduce traffic congestion in cities.

IV. Results

Digital Transport systems improve route planning, reduce waiting times, provide real time information. Challenges include budget limitations, technical expertise gaps, resistance to change.

Digitalization can significantly improve mobility and sustainability in small cities. effective adoption requires strategic planning, stakeholder engagement and gradual technological integration. Future research should explore scalable and regionally integrated solutions.

REFERENCES

- [1] <https://www.researchgate.net>
- [2] <https://www.innovationnewsnetwork.com>
- [3] <https://www.sciencedirect.com/journal/transportation-engineering>