

## IT SOLUTION FOR THE PUBLIC TRANSPORT

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**Abstract.** *Authorities of our country do not ensure the information about all the modifications done in timetable that creates difficulties for the population to reach the destination. Our solution is based on a simple, accessible app for everyone, that offers the real time location of public transport due to GPS, updates of all changes in schedule caused by accidents, route modifications, offers the approximated time of arriving to a station. Our technical solution represents a fundamental step towards the implementation of Intelligent Transportation System (ITS) in our city.*

**Key words:** *public transport, Intelligent Transportation System, information, schedule*

### The Problem of Public Transport

Urban passenger transport represents an area with a vital socio-economic function for modern cities, where its efficient, sustainable and accessible planning represents a challenge for the municipal authorities. Therefore, at the stage of city development, one of the main objectives of public authorities is to create a safe, accessible, reliable and environmentally friendly public passenger transport system.

The poor city infrastructure, the poor economy and the lack of human resources makes the improvement of the public transport system a hassle. Companies such as RTEC (Regia Transport Electric Chișinău) responsible for the eco-transport (trolleybuses), do not have any means of direct communication between each other and the public. The traffic jams at rush hours or during certain holidays, accidents, police, hazards and any other exceptional events remain unknown to a big part of the public, leaving people wondering if the transport they need is just being delayed or will not ever arrive. Worst case being that what they are waiting for will not arrive, therefore a missed opportunity, a date, a closed deal or a missed doctor appointment.

### Solution and the ITS

At the given moment, there are a few options, but due to the fact that they are foreign, they do not provide proper tracking of the public transport. The local options only provide the transport routes, with a few other additional features but most of them unrelated to the traffic.

If there was a way for the people to get up-to-date information regarding the trolleybus location in real-time, it would have allowed people to arrive at their destination on time without any delay, inform them about the situation at hand in order to choose an alternate option “ITS” - Intelligent Transportation System represents the implementation of a multitude of modern technologies into the public transport sector, with the aim of improving user experience without fundamentally changing the core infrastructure of the transport modus operandi. Such technologies include: electronic LED displays, automated ticket sellers, online ticket purchases, security systems.

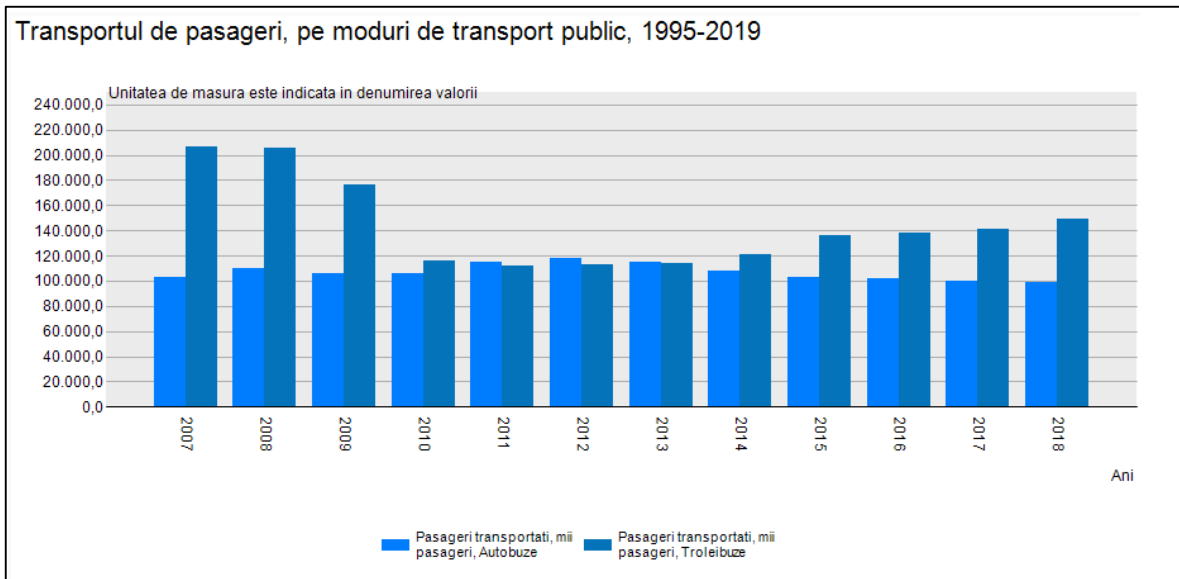
The systems required for implementation are:

- Traffic tracker - a system that tracks the geo-location and movement of the registered public transport.
- Traffic lights tracker - a system to be taken into account during calculation of the other features, such as arrival estimator.

- Arrival estimator - a system that estimates arrival time of public transport to certain destinations based on multiple calculations such as: the time of day, distance, traffic lights & events.
- End-user information distribution - a system that collects and distributes official and unofficial information to the end-user local session [1-6].

**Data Analysis. Official Statistics**

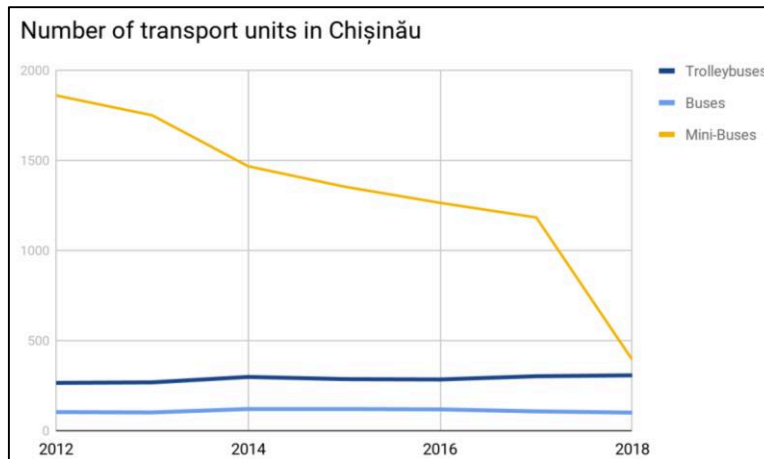
We decided to check some statistics from the National Bureau of Statistics of Moldova. Unfortunately, we could not find any data regarding how frequent does public transport units run late or the average waiting time past the schedule for the citizens. Fortunately, we found some information regarding the number of passengers using the eco-transport (trolleybus) instead of other types of public transport such as buses and micro-buses (maxi-taxi) in Chișinău, which can be seen below.



**Figure 1. Yearly Intake of Passengers**

What can be observed, according to Figure 1 is the fact that the number of passengers transported by the trolleybuses has dropped significantly in the last decade, probably due to the high emigrating rate of the population. Except for the years 2011, 2012, 2013 the trolleybuses had a larger intake of passengers than the buses, showing us that trolleybuses are for more used [7].

We investigated some data from General Department of Means of Communication and Transport regarding the number of transport units in Chișinău, which can be observed in the graph below [8].

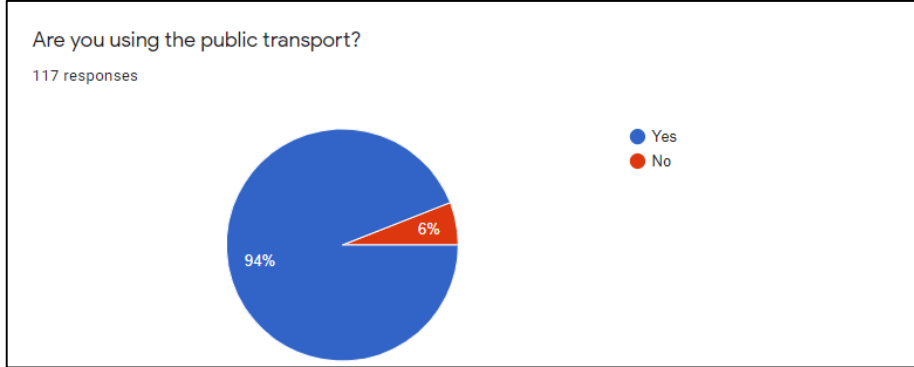


**Figure 2. Number of Transport Units, Chișinău**

We found out, according to Figure 2, that the number of mini-buses (maxi-taxis) has been decreasing since it reached its all-time pick back in 2012, holding over 1800 units in Chișinău alone back then [8].

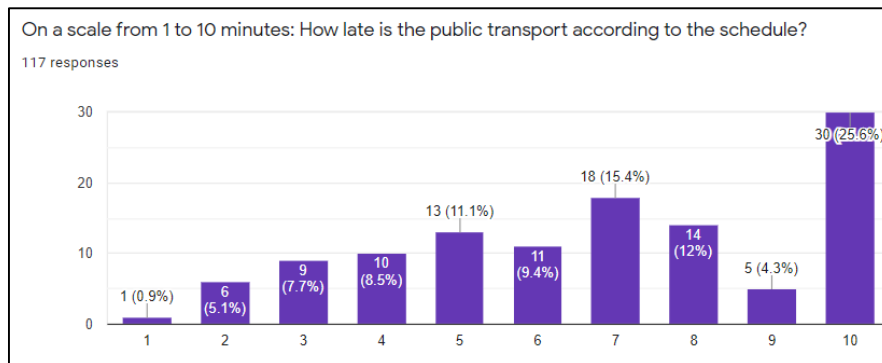
**Data Analysis. Opinion Survey**

In order to gain valuable and relevant data, an opinion survey was conducted with over 100 people. After analyzing the results of the opinion survey, we are presented with the data shown below.



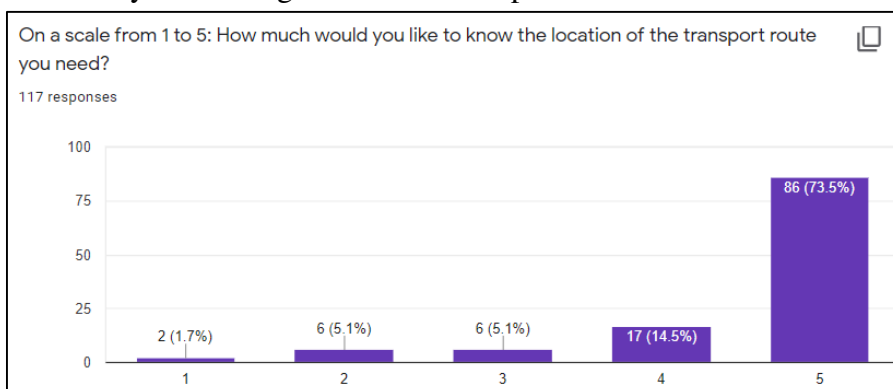
**Figure 3. The Use of Public Transport**

According to the figure above, over 90% of the interviewed answered that they are using public transport, while the rest, which represent approximately 7-10 people are using their personal transport. When asked about the average delay of the public transport, the interviewed shown some interesting answers and we categorized them from a scale from 1 to over 10 minutes, shown in the graph below.



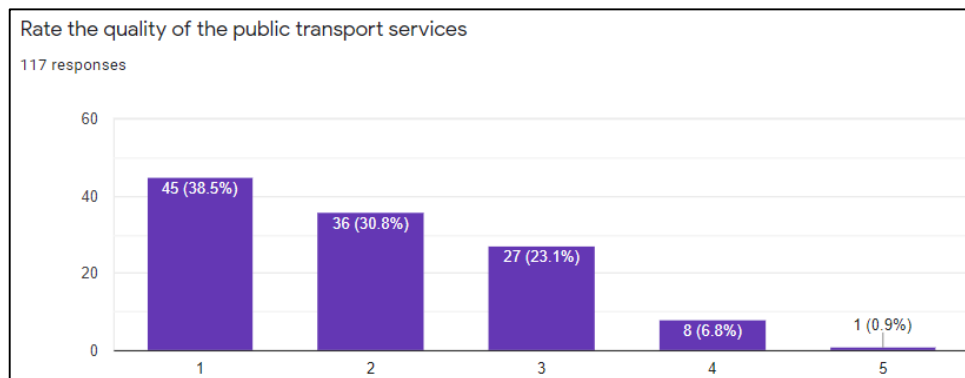
**Figure 4. The delay of the public transport (minutes)**

We can see just how unreliable the schedule system for public transport is by analyzing Figure 4. We discovered that over 25% of the interviewed are waiting for at least 10 minutes past the scheduled time for their route, other popular responses were 7 minutes (over 15%), 8 minutes (over 11%) and 5 minutes (over 10%) past the schedule. Next, we focused on analyzing the public opinion about the ability of tracking the desired transport route.



**Figure 5. The need for location of the transport route**

According to Figure 5, around 87% of the interviewed manifested and enthusiasm over the idea of live-tracking of the public transport units, while around 5% were neutral and the rest of them have manifested indifference over the matter. And the last question was how would the people rate on a scale from 1 to 5 the quality of the public transport services, shown in the figure below.



**Figure 6. The quality of public transport services**

According to the figure above, over 30% of the interviewed people answered that the quality of public transport services is below average and over 35% answered that the quality of the services is very poor.

### Conclusions

By analyzing the obtained data from the opinion survey, which received over 100 responses, the data from the National Bureau of Statistics and General Direction of Transport and Communication Routes combined, it is obvious that despite the large number of people who are using the public transport, the quality has remained unchanged over the course of years. Also, a great number of customers remain dissatisfied by the quality of the transportation services and would like to track the real-time location of the transportation units. The suggested solutions in this article would solve or mitigate the problems encountered by the population on a daily basis while using the public transport.

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