

A COMPARATIVE ANALYSIS OF PASSENGERS' PERCEPTION OF URBAN TRANSPORT: BUCHAREST VS WARSAW

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Abstract

This study is a comparative analysis on urban transport passengers' perception regarding specific features that influence end-users' quality perceptions, such as accessibility, comfort, journey time, fare and technology. The research is based on 490 survey's respondents from Bucharest, Romania, and 80 survey's respondents from Warsaw, Poland. The main purpose is to identify the best ways to improve the urban public transport service. To this end, a comparative assessment of the perception of the citizens of Bucharest and Warsaw regarding the urban surface transport service was made and the strengths of Warsaw's urban transport were identified. For urban transport in Bucharest, the results of the survey indicate a majority negative perception of the quality of services provided by local transport company. In the case of Warsaw, respondents have a diametrically opposed general opinion on urban transport. The majority positive perception is justified by the high accessibility of the transport network, journey times, waiting times and especially the clear trend towards digitalisation of urban transport service.

Keywords: urban transport; Bucharest urban transport system; Warsaw urban transport system; passengers' perception.

1. INTRODUCTION

Urban transit solutions adopted by public transport authorities are being boosted by the rising need for mobility in cities, with proximity and connectivity as key elements (UITP, 2015). Passenger transport within cities is seen as a top priority by Romania's local authorities since it has a significant impact on the country's long-term prospects for sustainable growth and contributes to an improved standard of living for city dwellers (Bran, Burlacu, Alpopi, 2018).

Transport and mobility are essential components of any nation's effort to advance their socioeconomic standing. One of the fundamental ideas that led to the formation of the European Union was the principle of unrestricted movement of both people and goods across its member states. Mobility is a crucial component of any urban and regional development since it connects activities over time and place influencing activity patterns and travel routes. Given the conventional conception of cities as hubs where people come together to trade goods and engage in social activity, mobility has a significant effect on both society and the economy. (Barabino & Deiana, 2013; Roselló, Langeland & Viti, 2016).

Today's mobility options are becoming more complicated, but they have a lot of potential if they are directed toward environmentally friendly urban transportation options. The current challenge for governance models is to sustain the urban mobility mission while preserving a corporate strategy in order to serve the public benefit and, more directly, the people. In some parts of the world, the role of the government and its progressive assertion are crucial in this regard. In addition to these initiatives, the public transportation industry is working to adjust to a shifting cost structure and manage financial constraints by looking into new revenue streams in order to enhance the caliber of urban transportation and, of course, the perception and quality of passengers' life (Makovšek & Logožar, 2014; UITP, 2019).

According to recent research, market opening helps mitigate the detrimental effects of funding reduction (Hensher & Wallis, 2005) by encouraging operators to enhance their performance as measured by metrics like bus costs per vehicle kilometer or operating costs, in addition to raising the average service supplied per unit of expenditure and their productivity levels (Cox & Duthion, 2001).

According to the most recent statistics, urban transportation has been losing attraction for many years. Despite the expanding populations of the world's economies, travelers are using this form of transportation less frequently to go between urban and non-urban locations (Swianiewicz & Brzóska, 2020; Grondys & Ślusarczyk, 2022).

The objective of this study is to conduct a comparative analysis on urban transport passengers' perception regarding specific features that influence end-users' quality perceptions. The study's respondents are from Bucharest, Romania, and Warsaw, Poland.

2. LITERATURE REVIEW

The public transportation system is widely regarded as one of the most significant components of a city's overall infrastructure. This is due to the fact that it seeks to take control of passenger flows as they move from one area of the city to another and ensures connectivity between various points of interest for those passengers (Poroseatcovschi & Ambrosi, 2010). Public passenger transport was and still is an

indispensable service for an urban structure in continuous development, an aspect that could also be observed in Bucharest, after the passage of approximately 150 years since the appearance of tramcars in 1871 (Baltă, 2003).

2.1 Urban public transport

Municipal service delivery is constrained by many challenges, such as capacity, finance, governance, coordination, inadequate local council decisions and a lack of adequate regulatory support, which become stronger by the speed and scale of urbanisation (Marumahoko, 2020). In this context the number of routes and stations make up the two fundamental aspects that influence public transportation networks expand. A route includes a certain number of stops along its path. Passengers are able to make their way from station A to station B and back again under normal circumstances. As a city expands, so does its system of public transportation; nevertheless, this expansion is restricted, and the system is subject to ongoing modification, which may involve the addition or subtraction of certain routes (Lu & Shi, 2007).

The characteristics of the public transportation service that distinguish it from private transportation are as follows: mass character, accessibility, regularity, universality and periodicity. The term "mass character" refers to the movement of groups of people according to a traffic schedule that has been established in advance and does not take into account the total number of passengers. The term "accessibility" refers to the fact that this service is available to anyone. The term "periodicity" refers to the fact that this service is provided continuously, at predetermined intervals of time, in accordance with a predetermined timetable. The term "universal" character refers to the fact that all citizens are treated equally when it comes to the use of public transportation for people (Mihalache & Păduraru, 2015). The authors Steg and Gifford (2005) claim that the quality of transport services is evidenced by the following criteria: duration (the amount of time spent by citizens on a trip); accessibility (citizens' access to public transport and connecting transport routes); the computer system (application through which citizens have access to information about vehicles intended for public transport in traffic); and how the service is provided.

Beginning with the aforementioned, a great number of research have attempted to determine which of the most significant challenges facing public transportation are responsible for the decline in the overall quality of this service. Authors like Zavitsas et al. (2010) showed that: traffic congestion, car dependency, political tensions, safety and economy are among the biggest problems. Particular to the transportation systems of large cities, congestion has emerged as one of the most significant challenges posed by modern life (Carrel, Halvorsen, & Walker, 2013). When more people need to get somewhere than there are vehicles available to take them, traffic jams form. Congestion is caused by citizens' shifting priorities

away from public transit and toward individual automobile use. Congestion causes an increase in the amount of emissions and energy consumed per passenger-kilometer, which makes the use of roads even more unsustainable. In recent decades, planners of transportation services and routes have come to recognise that reliance on automobiles presents a significant challenge due to the significant economic and social impact that it has. Therefore, reliance on automobiles is one of the primary factors that contribute to traffic congestion, and it also has extra adverse effects in terms of the environment and operational efficiency (Zavitsas et al., 2010).

Additional research conducted by Hensher, Ho and Mulley (2015) revealed that the primary difficulties facing public transportation around the world have not been overcome: the number of people using public transportation is decreasing, while the number of people using private cars is increasing; urban areas are becoming increasingly congested; citizens' frustration with a public administration that fails to adapt the transport system to their demands; and the reality that public transport cannot yet compete with private transport in terms of privacy, flexibility, and comfort. The researchers also noted some advantages of public transportation, such as the convenience of not having to drive, the low cost, and the great availability of trams during traffic jams.

The increase in mobility has had an effect on the performance of the transportation system in terms of its capacity, as it must respond to a greater demand and it also has to reach more and more distant destinations. Additionally, public transportation must be even more flexible, as it must respond to a more varied and constantly changing range of needs in order to meet the requirements of residents (Androniceanu, 2016; Roselló, Langeland, & Viti, 2016).

According to the authors Redman et al. (2013) public transport must consider a number of qualitative characteristics to attract private car users. Among the main physical characteristics of urban transport we can list: reliability, frequency, speed, price, accessibility, availability of real-time information, as well as simple and fast transport connections (intermodal). At the same time, passengers can perceive a series of qualitative characteristics of the urban transport service through aspects related to the comfort of the trip, their safety, the convenience or the aesthetics of the service infrastructure.

2.2 Urban transport passengers' perception

According to Woldeamanuel, Obsie, and Woldensae's (2022) observations, the attitude that passengers have toward public transportation can be either positive or negative. Both perspectives have the potential to be perceived as a result of the total benefits of the service or a specific service attribute. For example, Marteache et al. (2015) noted that if safety is viewed poorly due to overcrowding and deteriorating on-time performance, it raises passengers' apprehension and discourages them from utilising public transit.

In addition to dependability, cleanliness and comfort, passenger expectations also include a sense of security in the surrounding environment. In addition, Karlsson and Larsson (2010) presented the association between travel duration and the availability of seats. According to their findings, travel time is seen to be longer for passengers who are compelled to stand due to congested conditions during their voyage. Passengers' negative opinions regarding urban transport may discourage them from using it (Domarchi et al., 2008).

The positive perception, on the other hand, stems from the fact that certain urban transport means have the ability to avoid congestion, provide comfort and active accessibility to city centres (Colesca et al., 2017), and are a viable alternative mode to the personal automobile, which experiences parking shortages during peak hours, particularly in the inner-city areas. All of these factors have contributed to the positive perception (Shaharudin et al., 2018). Moreover, Kamaruddin et al. (2017) investigated the benefits and concerns regarding the quality of service for public transportation systems. Their research revealed that there is a positive correlation between advantages and service quality, which suggests that the implementation of public transportation will pave the way for ecologically responsible growth by stimulating a shift away from private automobile use.

2.3 Urban transport digitalization

Recent advancements in technology have made it feasible to develop and put it into practice a diverse array of strategies, procedures, and policies pertaining to traffic management. Vehicles for public transportation are equipped with localization and communication technologies, which make it easier for users to navigate the system and contribute to a favourable impression of the service. Additionally, improvements have been made to the transport infrastructure in urban areas, including automated tracking, monitoring and support systems for improved road traffic management.

Musatova et al. (2016) argue that one of the most important goals of developing "smart cities" is to attract people who have a high capacity for innovation and entrepreneurship, therefore the use of smart technologies in public transportation is a crucial component of this goal. In the current demographic climate, ensuring that large cities continue to have a steady supply of youthful residents is essential to the continued growth of these areas. Therefore, it is important to look into how young people currently perceive their use of public transportation in order to build and modify city policy in this area.

The idea of a smart city will require significant contributions from the public transportation system. It is planned to integrate data obtained directly from public transport services (such as electronic ticketing, video, automatic vehicle positions, and so on) with monitoring and information systems. These systems will be designed for use in real time, online and offline applications. According to Roselló, Langeland and

Viti (2016), the implementation of vehicle-to-vehicle and user-to-vehicle communication systems will make it possible to expand the range of multimodal alternatives, leading to a more proper utilization of the capacity of transport systems.

Time is valuable these days, and losing it by waiting for the bus for an extended period of time can be eliminated with a smart system of public transport. Here we are talking about GPS systems to help people who use public transport to get around. The user receives information regarding the present location of the buses that are closest to the station they are using. On the basis of this information, the user is able to alter his timetable, thereby reducing the number of hours spent waiting at the bus terminal (John et al., 2014).

It is important to provide accurate and timely information about public transport to increase its effectiveness. Passengers will be informed of the arrival times of trams and buses, allowing them to plan their journeys accordingly. The system will become more user-friendly as a result of real-time monitoring and changes, which will in turn encourage people to use public transport. In conclusion, a smart city cannot run in an archaic manner; rather, it must promote the use of available technologies and systems that will lead to an improvement in service quality and implicitly to a positive perception of the beneficiaries (Kanthavel, Sangeetha & Keerthana, 2021).

3. METHODOLOGY AND SAMPLE

The aim of this research is to compare the degree of satisfaction of users of urban surface transport services in Bucharest and Warsaw, taking into account factors such as accessibility, comfort, journey time, fare and technology. The purpose of the study is to identify the best ways to improve the urban public transport service. To this end, a comparative assessment of the perception of the citizens of Bucharest and Warsaw regarding the urban surface transport service will be made and the strengths of Warsaw's urban transport will be identified in order to propose to decision-makers initiatives to modernise the urban transport service in Bucharest, based on Warsaw's experience.

The research objectives were operationalized through a questionnaire-based survey, conducted online in both Bucharest and Warsaw. The questionnaire contained 17 questions and was distributed to citizens in May 2022 via social media on official local community groups from Bucharest and neighbouring municipalities. Thus 513 questionnaires were filled in, of which 490 were validated. A similar procedure was followed in Warsaw, where 89 questionnaires were filled in online, of which 80 were validated.

The identification of respondents was carried out using a non-probability method, i.e. convenience sampling. The representative sample size was identified with the formula (Androniceanu, 2016):

$$n_0 = \frac{Z^2 * pq}{e^2}, \text{ where}$$

Z - confidence level predetermined by the researchers

p - percentage share characterised by an attribute

q - percentage share not characterised by a particular attribute: 1-p

e - level of precision of results

n_0 - representative sample size

Thus, it resulted that the representative sample size is of 384 respondents.

Regarding the characteristics of the sample, four socio-demographic aspects considered relevant in a research in the field of urban transport were followed, namely age, gender, residence area and monthly income level. Table 1 captures comparatively the weights recorded at the level of the two samples, in Bucharest and Warsaw, associated with the above-mentioned characteristics.

TABLE 1 MAIN SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE SAMPLES

Item	Bucharest sample	Warsaw sample
Age:		
18 – 26 years	11.02%	16.48%
27 – 36 years	23.26%	21.24%
37 – 49 years	35.51%	41.23%
50 – 69 years	29.18%	20.01%
more than 70 years	1.03%	1.04%
Gender:		
Male	42.24%	46.25%
Female	57.76%	53.75%
Residence:		
Urban area	96.13%	81.25%
Peri-urban area	3.87%	8.75%
Monthly income:		
less than 500 euro	22.85%	8.75%
501 – 700 euro	26.93%	16.25%
701 – 900 euro	19.79%	42.5%
more than 900 euro	30.43%	32.5%

Source: sample size by researches, May 2022

The weights of socio-demographic characteristics reflect a greater heterogeneity of respondents in Warsaw, especially in terms of age, gender and income level. Analysing the sample in terms of residence environment, there is a predilection for respondents residing in the two large metropolises, which can be explained by the low share of urban transport lines from the urban area to neighbouring localities in both cities.

4. RESEARCH FINDINGS

The frequency of use of urban transport is one of the key parameters in relation to the relevance of the opinions expressed by respondents. Thus, 54% of respondents in Bucharest use urban transport

frequently and very frequently, and 26% use it a little and very little (Table 2). In Warsaw we can see that the majority, 75%, use the urban transport network frequently and very frequently, and 10% a little and very little. If in the case of Bucharest, we consider that the percentage actually reflects the preference of citizens to use personal cars to travel between different points of interest, in the case of Warsaw the percentage can be interpreted as an expression of the attractiveness of urban transport and its ability to provide viable travel alternatives for citizens.

TABLE 2 FREQUENCY OF USE AND TIME SPENT IN URBAN TRANSPORT VEHICLES

Item	Bucharest	Warsaw
Frequency of use:		
very frequently	29.79%	21.25%
frequently	23.86%	53.75%
moderate	17.14%	15.00%
little	10.20%	6.25%
very little	19.01%	3.75%
Time spent daily:		
less than 30 minutes	30.83%	13.75%
30-45 minutes	20.40%	38.75%
45-60 minutes	18.57%	36.25%
60-120 minutes	10.61%	10.00%
more than 120 minutes	19.59%	1.25%

Source: research results, May 2022

The time spent daily in urban transport vehicles is another indicator of the degree of use of urban transport by respondents in Bucharest and Warsaw. While more than 69% of respondents in Bucharest say they spend up to one hour in urban transport vehicles (Table 2), in Warsaw the percentage rises to more than 88%. Possible causes include traffic congestion in Bucharest, poor traffic lights and traffic management, and the lack of special lanes for urban transport vehicles (especially for buses). The high percentage recorded for Warsaw reflects the traffic congestion, but especially the long distances travelled by citizens, given the large surface area of Warsaw.

The level of quality of urban transport services is perceived by respondents in Bucharest as low (37%) and very low (23%), with only 4% of citizens having a good and very good perception of the quality of urban transport services (Table 3). In Warsaw respondents perceived the quality of urban transport as high (46%) and very high (17%) and only 6% have a negative opinion about the quality of services provided in urban transport system. Moreover, the median of the responses in the Warsaw sample is 3.70, compared to 2.22 which is the median of the responses in the Bucharest sample, which definitely indicates a much higher perception of Polish respondents about the quality of urban transport in Warsaw, as compared to the perception of Romanian respondents about urban transport in Bucharest.

TABLE 3 PERCEPTION ABOUT LEVEL OF QUALITY IN URBAN TRANSPORT

Quality level (Likert scale)	Bucharest	Warsaw
very high	1.38%	17.50%
high	3.06%	46.25%
moderate	35.61%	30.00%
low	36.73%	3.75%
very low	23.21%	2.50%
Median of responses	2.22	3.70

Source: research results, May 2022

In order to understand the respondents' perception of the level of quality of urban transport services, respondents were asked a question about transport capacity and the demand-supply ratio in the urban transport service. The opinion of respondents in Bucharest, 73% of whom consider that transport capacity is insufficient in relation to the travel needs of citizens, further supports the predominantly negative perception of the quality of urban transport services. In Warsaw, only 34% of respondents believe that the local transport company does not have enough transport capacity to meet the travel needs of its citizens, which in fact justifies the positive opinion of Polish respondents regarding the quality of urban transport services. However, 65% of the respondents in Bucharest answered negatively to the question concerning the increase of urban transport fares for the purchase of new transport vehicles, which means that the respondents are not willing to pay for the investments in the modernization of local transport company's vehicle fleet, despite their dissatisfaction with the travel conditions. On the other hand, in the case of Warsaw 69% of respondents would not agree to increase urban transport fares in order to purchase new means of transport, while 66% consider the transport capacity of the local transport company to be sufficient. Taking into account the fares charged for urban transport in Warsaw and the GDP per capita, it appears that Warsaw's citizens pay the lowest fares in the capitals of the European Union. Therefore, respondents in Warsaw do not want a fare increase and are content with the current comfort level of public transport.

The perception of the level of quality of the urban transport service is also determined by the level of user satisfaction, so respondents were asked to rate their own level of satisfaction on a Likert scale of 1 to 5, where 1 is very low and 5 is very high (Table 4).

TABLE 4 USERS SATISFACTION REGARDING URBAN TRANSPORT

Users satisfaction level (Likert scale)	Bucharest	Warsaw
very high	8.36%	18.75%
high	21.62	63.75%
moderate	35.91%	13.75%
low	20.40%	2.50%
very low	13.71%	1.25%
Median of responses	2.90	3.96

Source: research results, May 2022

The median of the responses in the Bucharest sample was 2.90 and in the Warsaw sample 3.96, which indicates a higher level of satisfaction of the Warsaw respondents than of the Bucharest respondents and equally argues the perceived quality levels of the two samples with regard to urban transport in the two European metropolises. In fact, 83% of the respondents in Bucharest would be willing to give up their personal car if the urban transport service met needs such as accessibility, comfort, technology, average travel time, etc. Linking this trend with the low level of satisfaction and the modest level of quality perceived by the respondents in Bucharest, we deduce that it is precisely the satisfaction felt by the user as a result of the low level of quality of urban transport services that leads citizens to use their personal car to travel in the city. In Warsaw, 77% of respondents suggested that they are willing to give up the personal car in favour of using urban transport, which means a relative contradiction with the answers to the questions on the quality of urban transport services and the level of satisfaction felt by the respondents.

The research also sought to identify the respondents point of views related to a measure taken to support the fluidity of urban transport, especially for buses, such as the introduction of special lanes for urban transport vehicles. Interestingly, only 57% of respondents in Bucharest believe that such a measure contributes to improving the quality of urban transport, while in Warsaw the percentage of respondents who consider this to be useful rises to 87%. The explanation may be that in Bucharest respondents evaluated the option of introducing special lanes for urban transport vehicles in terms of their own interests, those related to the use of personal cars for city travel. On the other hand, the percentage also hides a latent desire of citizens who frequently use urban transport to travel as quickly as possible by surface transport, especially buses, precisely because they do not have access to metro transport.

5. CONCLUSIONS

The general perception of urban transport in Bucharest and Warsaw was benchmarked using the questionnaire survey. Given the sampling method used, the research has a number of limitations concerning the representativeness of the sample and the sample size, especially in the case of the sample of respondents in Warsaw. Moreover, the questionnaire was distributed online on social media groups, which makes the level of confidence in the respondents' answers questionable. In addition, the research was conducted in May 2022, in the post-pandemic period, when the reluctance of the majority of respondents to use urban transport as an effect of overcrowding in the means of transport influences their perception.

Public transport remains a vital service for the community, especially in urban and peri-urban areas, and therefore needs to be constantly connected to the needs of the population, be dynamic and open to change, and incorporate in its nature and structure the technological challenges necessary to increase

user satisfaction. For urban transport in Bucharest, the results of the survey indicate a majority negative perception of the quality of services provided by local transport company. A possible explanation is related to the poor way in which the operator provides public transport, an issue captured in various ways by the questions asked to respondents in the questionnaire. The negative perception is determined by aspects such as: routes not updated with citizens' transport needs (especially in the case of newly developed residential areas), low comfort in vehicles, long waiting time at the station, poor technology, but also traffic jams and rush hour congestion in urban transport.

Respondents suggested a number of ways to improve urban transport in Bucharest, such as the development and implementation of an electronic system for displaying the service timetable and waiting times in stations, increasing the level of comfort in vehicles, creating special lanes for urban transport, purchasing vehicles with a larger transport capacity. In addition to these initiatives, a series of measures are planned to improve traffic organisation and avoid traffic jams through intelligent traffic lights. But all these measures require considerable investment, which citizens are not willing to bear, as they do not agree with the transport operator's fare increases.

In the case of Warsaw, respondents have a diametrically opposed general opinion on urban transport. The majority positive perception is justified by the high accessibility of the transport network, journey times, waiting times and especially the clear trend towards digitalisation of urban transport service. But at the same time, it can be seen from the survey results that the fare system and the level of comfort are not considered satisfactory by the respondents. Thus, at the perception level, the local transport company is continuously investing in public transport, focusing on meeting the transport needs of Warsaw citizens.

Recent developments in the urban transport service in Bucharest are found to be modest compared to Warsaw and are characterised by a lack of technological advancement and out of step with citizens' travel needs. The research results suggest the need of rethinking the urban transport system in Bucharest in order to improve the quality of the services provided to a level comparable to that in the capitals of the European Union.

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