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Summary

STRATEGIES OF INNOVATION AND INTEGRATION OF PUBLIC URBAN TRANSPORT POLICIES

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CONTENTS

INTRODUCTION

Urban public transportation is often seen in specialized literature as a highly efficient means of passing to durable mobility, which in turn leads to building sustainable cities. Smart mobility presupposes the creation of modern transportation systems, and providing a type of logistics using advanced management systems. Urban public transportation may increase the integrity of the environment, providing people movement in a safe, efficient, profitable and ecological manner.

Promoting urban public transportation allows for improving traffic, with a positive impact on the environment, reducing traffic jams. Municipalities encourage the use of urban public transportation to reduce all the negative effects brought about by transport overcrowding. A sustainable urban public transportation system is based on innovative solutions able to provide smart mobility. These solutions include modern technological methods and organizational techniques allowing for the improved efficiency and quality of a city's transportation system.

The present PhD tackles the implications of management policies and strategies on the urban public transportation system. In order to optimize urban traffic one needs a well developed strategic plan founded on a system allowing for the successful management of various traffic scenarios. An advanced management system should allow the improvement of transportation through providing traffic data on overcrowding and unforeseen events by means of high-performance transmission devices.

The teoretical section of the thesis includes: the management applied in the transportation sector, the present-day framework of the Romanian urban public transportation, the rehabilitation of the urban public transportation in the municipality of Galati – ensuring the link to sustainable transportation and the strategy for urban transportation in the municipality of Galati. Road infrastructure has become more and more crowded in the past few years, as a result of an increased popularity and desire of the public to enhance personal mobility. It has triggered severe traffic jams, especially at rush hours, thus pointing towards the need for a traffic management system able to perform efficiently in accident prevention, and cutting down carbon dioxide emissions, as well as decreasing the impact on the environment and time waste in traffic. Hence, an efficient and reliable traffic control system is the key to reducing traffic jams.

The applications in the PhD refer to the study on the customer satisfaction degree of the passengers using the transportation system of TRANSURB S.A. Galați. The development of urban transportation systems takes place through management strategies and policies that directly involve municipalities. The effectiveness of measures taken in the transportation system is determined by the users' reaction, and the adaptation of the urban transportation system to the beneficiaries' expectations. Thus, transport policies are significantly impacted by the cooperation of the interested parties who work in this sector. The cooperation of the parties involved occurs in all the stages of the process, from planning to solution implementation and operation. This cooperation is one of the decisive factors in achieving success with a sustainable transportation policy.

The analysis tools used in the present PhD are: the VOSviewer software, and the SPSS software. The former was used to revise the specialized literature in the field of management applied in the urban public transportation sector, being an innovative method used to identify the authors' interest in this domain. The latter was used to identify the passenger profile in the sector of urban public transportation in the municipality of Galați.

Specialized literature deals extensively with the topic of management applied to the field of urban public transportation, from the perspective of reducing the negative effects of pollution

by carbon dioxide emissions, proposing efficient solutions aimed at sustainable development. A highly important aspect which may contribute to the sustainable development of urban mobility is the promotion of a favourable image of the urban public transportation from the point of view of its quality. The public's satisfaction degree determines the percentual increase of public service use, and the decrease of the desire to use personal transportation. Taking into account the managerial vision, urban public transportation answers the public's need for travelling, facilitates the creation of strong communities, supporting the equitable social participation and economic development. In addition, the urban public transportation system is based on adequate institutional arrangements involving several interested parties so that all the initial objectives could be reached.

The objectives of the present research are as follows: identifying strategies of innovation and integration of the urban public transportation policies, describing the situation of urban public transportation in Galati at the present time, identifying the passengers' perception of the urban public transportation system, applying effective measures aimed at limiting the effects of environmental pollution. The novelty elements are: approaching a less explored topic, i.e. the management applied in the sector of urban public transportation, presenting the importance of management policies and strategies, focusing on the peculiarities of the urban public transportation sector in Galați, the evolution of the urban public transportation sector in the past few years, and the need for innovative measures to limit the effects of pollution.

City managers have to make a series of decisions, implement measures, and take actions that may reduce individual road transportation, thus developing the idea of sustainable travelling. The measures that may be implemented in a city refer to: increasing investment in the means of urban public transportation, integrating the system of urban public transportation in the city plan as a major goal, efficient systems allowing for the proper planning of common transportation, using small buses fit for the existing infrastructure, but at a higher frequency of arrival. The solutions for creating a a sustainable city are numerous, but all the interested parties should be involved. Local authorities have multiple attributions in implementing various decisions regarding the sector of the urban public transportation. The objective is to obtain an environment favourable to supporting, developing and implementing solutions that may contribute to the population's enhanced mobility, which may ultimately lead to the optimization of the entire city.

The cooperation of the local public authorities with the different interested parties is a must in planning urban public transportation. Furthermore, the citizens are seen as one of the most important decision-making factors in the successful implementation of an effective urban public transportation system. To them we may add public institutions, various merchants, local communities, non-governmental organizations, and private companies. The cooperation of all these entities is essential for the successful implementation of all initiatives of urban logistics, mainly in the transportation field.

CHAPTER 1. MANAGEMENT APPLIED TO THE TRANSPORTATION SECTOR

In the transportation field a high quality management requires a thorough training of the managers, and at the same time the change of their behaviour to the purpose of evaluating strategic issues in order to find the most efficient solutions for society and the environment. The management applied to the transportation domain focuses on: optimizing the price and energy consumption, and the full use of existing capacities.

Transport management is applied locally, nationally and internationally. Each management level is differentiated by the amplitude and importance degree granted to the objectives pursued. Moreover, implementing management methods depends on the basic principles of management. Public transport is a service sector, so that the users (passengers) participate in providing services in real time. Therefore, this process aims at two main functions: service production and use.

Management principles are divided into: principles of the socio-economic activities, principles in the systematic-systemic perspective, and principles of economico-social efficiency. The principles of socio-economic activity focus on: work activities' division, correlating authority relations, setting responsibilities, hierarchy, order and discipline, etc. The principles resulting from the systematic-systemic perspective focus on relational autonomy, the importance of the objectives, as well as the correlation of external factors with the internal factors. The principles of economico-social efficiency refer to: organizational efficiency, unity at the organizational level, the level of correlation between individual and group interests, encouraging employees to take initiative, correlating the results obtained by employees with the salary scale and the good relation between management and execution.

1.1. Management functions applied in the transport field

The objectives pursued through applying transport management are essential, encompassing key areas, like: the current status of the activated market, innovation in the transport field, productivity, the total resources involved, the employees' performances and attitude, the management's performance and attitude, the improvement methods at the management level and the beneficiaries' reaction. Public transport systems promote urban mobility, at the same time bringing financial benefits and city development opportunities, such as: increasing value of estate and properties as a result of improving accessibility.[1]

The management process includes the totality of actions of: estimation, organization, coordination, personnel training, and chacking the level of reaching the objectives of a plant or activity branch, like the transport sector. Transport is an important part of public policy as it contributes to the economic growth and provides opportunities of social consolidation and well-being.[2]

Management functions have numerous characteristics, among which:

- Management functions are universal actions, but compulsorily effected at management level, exerting a rational influence on a managed element;
- The actions included in the management functions are successive;
- Each exerted function influences other functions, the influence effect being mutual;
- The component actions of management functions are dynamic, their dynamic being influenced by the technico-scientific progress, the external medium of transportation, management development, and economic objectives on a national level.

Strategic management presupposes the implementation and formulation of key objectives of an activity sector together with the initiatives adopted by the organization's management. Moreover, in strategic management it is ensured that the decisional factors of organizations or specific activity sectors have the same opinion in regard to various actions or issues.

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[1] Zhang, M. (2023). Value uplift from transit investment-Property value or land value? A case study of the Gold Coast light rail system in Australia. *Transport Policy*, *132*, 88-98.
[2] Docherty, I., & Mackie, P. (2010). Planning for transport in the wake of Stern and Eddington. *Regional Studies*, *44*(8), 1085-1096.

Urbanization is one of the most significant processes of global change.[3] The phenomenon results in increased traffic flux in the urban areas, generated by the passengers' transport, as well as the commodity movement. The increase of the number of vehicles in urban areas has a negative impact on people and the environment, given the pollution. Traffic is one of the most important air pollution sources in urban areas.[4] Although social progress is significant due to the modernization of transport infrastructure, there are many drawbacks, so that it is desired to decrease the negative impact as a main focus of issuing urban development policies.[5]

1.2. Advanced management systems

According to the report of the 2019 Economic Forum, Romania is the 119th out of 141 countries analysed in point of the quality of road infrastructure. In Europe, it is placed last according to the number of highway kilometres for 1000 inhabitants. According to Eurostat, in 2019 only 848.12 km of the national road transport network consisting of 17091 km is at highway level.

The infastructure deficit at national level is reflected in: low mobility, low or insufficient level of regional connectivity, with an essential impact on regional disparity (mainly in the North-East of the country) and the rather high transit traffic in many places without circumventing possibilities, and the excessive waiting time when crossing the border.

Consequently, a marketing or communication strategy for promoting public transport is necessary, and may be seen as a relevant measure of a mobility management program.[6] in the past few decades, the environment and public mobility issues reflected in the increased number of cars and massive urbanization have evinced the need for practising and encouraging more durable modes of transport. Transport management presupposes the existence of relevant structures to manages means of transport that take into account the possible variations of transport structures. The main role of transports in economy is accounted for by their influence on the daily life of the population. Without a well-organized public urban transportation system, economic growth is reduced as the population's mobility may be directly affected.

Innovation in management involves introducing novelty in an organization, or a domain, and as such, it represents a peculiar form of organizational change.[7] The poorly developed road infrastructure has a direct negative impact on the economy and road transportation, bringing about increased time and transportation costs, the increase of fuel consumption, as well as maintenance and repair costs for means of transportation.

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[3] Elmqvist, T., & Maddox, D. (Eds.). (2018). *The urban planet: Knowledge towards sustainable cities.* Cambridge University Press.

[4] Tang, J., McNabola, A., & Misstear, B. (2020). The potential impacts of different traffic management strategies on air pollution and public health for a more sustainable city: A modelling case study from Dublin, Ireland. *Sustainable Cities and Society*, *60*, 102229.

[5] Black, W. R. (2004, July). Sustainable transport: definitions and responses. In *TRB/NRC Symposium on Sustainable Transportation*.

[6] Jones, P., & Sloman, L. (2003, August). Encouraging behavioural change through marketing and management: what can be achieved. In *10th international conference on travel behaviour research, Lucerne, Switzerland* (pp. 10-15).

[7] Birkinshaw, J., Hamel, G., & Mol, M. J. (2008). Management innovation. *Academy of management Review*, *33*(4), 825-845.

1.3. Innovation strategies in transportation

The term innovation has come into popular use in public sector domains, like the sector of housing associations (Walker & Jeanes, 2001[8]), public health (Mohr, 1969[9]; Kimberly & Evanisko, 1981[10]; King, 1992[11]) and the transport sector (Zuylen & Weber, 2002[12]; Geerlings, 1999[13]). Further research is necessary to apply the innovation theory in detail in the public transport sector. Both technological innovations, and organizational ones are important to the development of public transport services.[14] Undoubtedly, transport is one of the most important factors of economic, social, and spatial development of urban areas, but at the same time it is a major pollutant unless efficient strategic solutions are provided.

Innovation is another key resource in the success of the transport sector. Public urban transport may become the preferred mode of movement in cities, due to the greater interest in reducing traffic congestion in cities, and the evergreater wish to remove or reduce environmental problems. Inovation is connected to the process of inventiveness and unconventionality, while quality is associated to standardization, low tolerance for errors, and going through a systematic process.

Transforming durable transport into an integral part of policies on sustainable development and climate changes has to take into consideration the achievement of efficient national frameworks and determining the financing sources for the proposed solutions.

The concept of innovation refers to a wide range of actions, products and processes, such as: improving administrative, planning and programming systems, production processes and developing new products or improving existing ones. Innovation in management means searching for new values or new means of creating value.

Management aims at longterm performance, which in turn requires innovation and entrepreneurship. Innovation is one of the key factors differentiating organizations on the extremely competitive current markets. As a result, improving innovative performance is essential in creating the competitive edge.[15]

Public transport is an important decisional factor in urban development all over the world. Big cities everywhere are burdened with heavy traffic and all the negative consequences ensuing from pollution I the transportation sector. A way to solve this problem is introducing a high quality public urban transport for passengers, allowing for faster, more efficient transport.[16] the well developed transport system in the area is one of the essential factors in attracting the

[8]Walker, R. M., & Jeanes, E. (2001). Innovation in a regulated service: The case of English housing associations. *Public Management Review*, *3*(4), 525-550.

[9]Mohr, L. B. (1969). Determinants of innovation in organizations. *American political science review*, *63*(1), 111-126.

[10]Kimberly, J. R., & Evanisko, M. J. (1981). Organizational innovation: The influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations. *Academy of management journal*, *24*(4), 689-713.

[11]King, N. (1992). Modelling the innovation process: An empirical comparison of approaches. *Journal of Occupational and Organizational Psychology*, *65*(2), 89-100.

[12]Van Zuylen, H. J., & Weber, K. M. (2002). Strategies for European innovation policy in the transport field. *Technological Forecasting and Social Change*, *69*(9), 929-951.

[13]Geerlings, H. (2012). *Meeting the challenge of sustainable mobility: the role of technological innovations.* Springer Science & Business Media.

[14]Ongkittikul, S., & Geerlings, H. (2006). Opportunities for innovation in public transport: Effects of regulatory reforms on innovative capabilities. *Transport Policy*, *13*(4), 283-293.

[15]Sadeghi, A., & Rad, F. (2018). The role of knowledge-oriented leadership in knowledge management and innovation. *Management Science Letters*, *8*(3), 151-160.

[16]Zavada, J., Blašković Zavada, J., & Miloš, K. (2010). Conditions for implementing trolleybuses in public urban transport. *Promet-Traffic&Transportation*, *22*(6), 467-474.

population and production, an important advantage in distributing productive forces, which makes the integration effect stronger and more visible.[17]

Cities need to modernize fast in order to adopt a new paradigm able to provide access for everyone to a clean, safe and accessible mobility. Public urban transport is also safer and may reduce deaths from road transport, which account for 1.25 million deaths globally due to road accidents.[18] In order to promote durable urban mobility, the present system of transportation, favouring road trips, has to evolve. The new system should prioritize energy efficiency, environmental durability and better general qualities of urban life.[19]

In this respect, a coherent relevant management has to be efficiently applied to combine usefulness and sustainability. The rapid growth of economic sectors, and especially the road transport, is the obvious feature of developed countries, so that it may be said that pollution has a significant impact and is manifest through accelerated increase. Therefore, the permanent supervision and the upgrade of strategies applied in transportation becomes a must in every country.

1.5. Political and strategic tools

The extension of the urban structures is a major challenge to the public transport systems. The result is concretely represented by the increased demand for fast, safe, efficient, ecological travels, which also fulfil the requirements specific to various social groups. Transport is a key sector in any economy, and as such holds an interest in itself.[20] Coordinating and coperating in the field of public transport are necessary, not only locally and nationally, and even at a European level.

The fast digitalization of processes and innovation results has changed the existing theories on management in the services sector, questioning the fundamental hypotheses about the definitional limits on innovation, the innovation process and the relation between the innovation processes and results.[21] So, it is necessary to answer the questions about the formation and evolution of innovations, the manner of organizing the entities involved in innovation and the level of interaction between the innovation and the organization adopting it.

The strategy integrated in transport consists of a set of transport policy tools, clarifying the choice of startegic tools, the implementation period and the intensity of each policy. The strategic tools used to optimize transport services include: modifying tariffs and taxes for transportation services. Special attention is granted to approaching a strategy as the stage of the planning process matters.

Modelling strategies is different according to the stage of applying a correct management. Gallouj (2002) identifies six innovation models, as follows: radical innovation, improving innovation, innovation by replacement (or adding features), ad-hoc innovation,

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[17]Sakhapov, R. L., Nikolaeva, R. V., Gatiyatullin, M. H., & Makhmutov, M. M. (2016, August). Risk management model in road transport systems. In *Journal of Physics: Conference Series* (Vol. 738, No. 1, p. 012008). IOP Publishing.

[18]Aqib, M., Mehmood, R., Alzahrani, A., Katib, I., Albeshri, A., & Altowaijri, S. M. (2019). Rapid transit systems: smarter urban planning using big data, in-memory computing, deep learning, and GPUs. *Sustainability*, *11*(10), 2736.

[19] Businge, C.N., Viani, S., Pepe, N., Borgarello, M., Caruso, C., Tripodi, G., Soresinetti, S., 2019. Energy efficiency solutions for sustainable urban mobility: Case study of the Milan metropolitan area. *Urban Transport XXIV 182,* 151–163.

[20] Yaman, F., & Offiaeli, K. (2022). Is the price elasticity of demand asymmetric? Evidence from public transport demand. *Journal of Economic Behavior & Organization*, *203*, 318-335.

[21]Nambisan, S., Lyytinen, K., Majchrzak, A., & Song, M. (2017). Digital Innovation Management: Reinventing innovation management research in a digital world. *MIS quarterly*, *41*(1).

recombination innovation, objectivation or formulation innovation.[22] In the transport sector it is not necessary to use all the innovation models presented, but instead one should choose the model that is most suitable for the proposed objectives. Innovation in services depends on the characteristics of the service in order to enhance service quality. In the case of services, innovation of both exogenous and endogenous services occurs in practice.

Endogeneous innovation in services means changing technical competences or characteristics, and exogeneous innovation refers to external constraints, being triggered by external factors. The endogenous category includes the purely technical innovation and competency development, while exogenous innovation means that for instance the authority compels each operator to provide transport services of a certain standard.

Purely technical innovation means that certain technical features are adjusted: modifying or improving the infrastructure, replacing the vehicle. Innovation by replacing or adding some features when applied to the transport sector does not involve modifying the service competency or its characteristics, but adding or altering some elements. The new technology used in developing competencies differs from the technology used in purely technical innovation. In the past few years there has been an increasing interest in developing transport-integrated strategies, which may be accounted for by the evergreater awareness of the population in regard to transportation issues. In order to form the strategy, the necessary tools are the ones able to determine higher performance at the level of global strategy.

The targets of horizontal integration are the agencies and departments within the municipal administration in view of taking efficient measures; vertical integration is achieved among local, regional, national and European administrations, and spatial integration occurs between local and adjacent authorities. Modelling public urban transport focuses on a transportation network and a data set aiming at the spatial distribution of urban activities and their intensity, assessing 4 basic components of the travel model in an area: travel generation, travel distribution, modal quota, traffic.[23]

Public urban transport is the most durable manner of motorized transportation.[24] Hence, it is necessary to promote it in order to improve the living standard and the quality of life in cities characterized by the excessive use of private transport and high population density. Transportation may be seen as a complex social, technical and economic system, and in big cities the transport sector has to face ever higher mobility demands.

1.6. Advanced information systems for passengers

Advanced subsystems for passenger information are part of the road traffic management systems, and are of great importance. The subsystems for passenger information are based on notifications received from the Traffic monitoring centres and the transport management systems. The passenger information subsystems are a benchmark for the increase of the quality of transport services.

Innovation management may be applied successfully if the 4 stages of innovation are observed. So, the stage of **opportunity identification** explores and investigates the sources that may be used in the innovation process. The market opportunities and the technological

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[22]Gallouj, F. (2002). *Innovation in the service economy: the new wealth of nations*. Edward Elgar Publishing.

[23]Arampatzis, G., Kiranoudis, C. T., Scaloubacas, P., & Assimacopoulos, D. (2004). A GIS-based decision support system for planning urban transportation policies. *European Journal of Operational Research*, *152*(2), 465-475.

[24]Banister D (2008) The sustainable mobility paradigm. Transp Policy 15(2):73–80. https://doi.org/10.1016/j. tranpol.2007.10.00

opportunities are identified, as well as the domains where the strategic focus should lie and the manner of allotting resources in the innovation process.

Option selection is performed strategically, so that efficient business ideas are generated, developed, assessed and subsequently chosen for the transport sector in urban areas. Management methods may include: brainstorming, creativity techniques or focus groups. Resource planning and ensuring represent the **organization stage,** and in this stage one defines the desired result, the project duration and the innovation budget. At this stage also, the necessary means are allotted for the project, the implementation team is formed, and the necessary resources are allotted.

The final stage is the **implementation,** where project innovation actually takes place. At this stage the activities of design and development are performed to solve problems or increase performance at project level. The innovative strategy is part of the general strategy of the organization. By applying the innovation strategy, innovative activities are established, as well as the way of reaching them, and simultaneously the resources needed for reaching objectives. No matter the application domain, innovative strategies are characterized by the following aspects:

- They increase changes in the specific domain, and it becomes necessary to combien and coordinate strategic decision with current ones regarding marketing, financing, production, etc;
- They maximize the project's investment risks as managing new projects leads to the need for the efficient marriage between investing and innovating;
- They maximize the degree of result uncertainty as innovation risks need to be carefully managed.

Improving infrastructure, making information easy to access, reducing time and costs are essential factors in providing an attractive public transport.[25] The contents of a strategy is centred on the mission, values and objectives, and the process refers to strategic methods, tactics and formulated objectives, to be later implemented. Strategy formation presupposes the development of a direction and the most efficient achievement.

1.7. Public urban transport policies

Efficient public urban transports are essential to the economic welfare of the country. But without a relevant policy and a well defined management, even in big cities, the existing transport network may suffer because of: lack of involvement of the responsible authorities, car jams, unsafe conditions, high costs, pollution, low quality services. Cities in developing countries are faced with multiple constraints if they do not integrate the adaptation of the transport system to the passengers' needs in urban planning. Ongoing research on durable mobility highlight the need for changes, both technological and institutional, in order to achieve a radical system reconfiguration of the urban transport system.

Building a durable public urban transport system relies more and more on a series of innovative TIC solutions. These contribute to creating a so-called intelligent mobility, which is part of the concept of the intelligent city.[26] An important aspect of sustainable cities presupposes the creation of a transport policy aimed at reducing individual transport by means of personal

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[25] Yatskiv, I., Budilovich, E., & Gromule, V. (2017). Accessibility to Riga public transport services for transit passengers. *Procedia Engineering*, *187*, 82-88.
[26] Boichuk, N. (2020). Smart mobility jako podstawowy element koncepcji inteligentnego miasta–studium przypadku wybranych polskich miast. *Inteligentne Miasta*, 59-72.

vehicles. Hence, the use of public transport and other alternatives to individual transport should be promoted.

To reduce the negative influence of the urban transport upon the economy, environment, human health and life quality, the transport sector includes a series of activities, both regarding the transport of goods, as well as passengers.[27] taking into account the development and extension of big cities, public urban transport hugely impacts pollution reduction. Thus, development at a metropolitan level has become a necessity, in order to meet the citizens' requirements, and to provide population tailored services.

The relation between innovation and changing regulations in the field of transport is not new. The interaction between these two aspects focuses on the importance of a strong connection that may be experienced in several transport sectors. Public urban transport is essential in the economic growth of developing cities. For most inhabitants, public road transportation is the only means of access to work, education and other public amenities.[28]

Thus, managing innovative political tools is a crucial aspect for the favourable implementation of the urban transport policy. The potential of emergent modern systems should be explored as a response to information technology that is able to provide rapid and flexible answers, adapted to real time changes, regarding the travel requirements, restriction imposition, and exploring technological solutions especially in cities with limited resources.[29]

The integration forms may determine a wide set of objectives (integrating means of transport and estates), the integration with different policies, which requires understanding their objectives. Transport-integrated strategies have long been promoted as a more realistic and efficient approach to solving urban transport issues in comparison to individual measures. Public urban transport has acquired more attention in the past few years as a means of improving sustainability and improving the quality of urban life. Economic and environmental performance in cities may be improved by the efficient connection of resources and facilitating mass mobility.[30]

Integrating services of public urban transport may be achieved by a detailed analysis of the current situation and the complex understanding of what makes up public space, at the same time encouraging the participation of the interested parties in the decisions that may affect local communities. Public urban transport has a significant impact on the economic, financial, social, as well as natural environment. Thus, it is necessary that the administrative units should eliminate the negative effects of this impact by effective measures.

The transport modernisation strategies in urban areas evince various development trajectories presupposing multiple societal challenges, but they also involve means or solutions for coping with the various problems of urban transport. The urban development policies are modelled according to the demand for travel and the existing infrastructure.

[27]Pietrzak, K., & Pietrzak, O. (2020). Environmental effects of electromobility in a sustainable urban public transport. *Sustainability*, *12*(3), 1052.
[28]Pojani, D., & Stead, D. (2015). Sustainable urban transport in the developing world: beyond megacities. *Sustainability*, *7*(6), 7784-7805.
[29] Meyer, M. D. (2008). Design standards for US transportation infrastructure: The implications of climate change.
[30] Bok, J., Kwon, Y. (2016). Comparable Measures of Accessibility to Public Transport Using the General Transit Feed Specification. Sustainability. 8(3), pp. 224-236

1.8. Revision of specialized literature in the field of management applied to the public urban transportation sector by means of the VOSviewer software

Taking into account the ever increasing number of publications in the past 10 years in the field of management applied to the level of sustainable public urban tarnsport, it is my opinion that a detailed analysis of this field is of utmost importance, and is at the same time in need of extension and consolidation. Through this thesis I wish to identify the role and essence of the management in the transport sector, and create an overview of the present state of knowledge and research.

Thus I created a conceptual map reflecting the characteristics and fundamental components in the sector under investigation. I performed a complex and comprehensive bibliometric analysis of the academic literature on general management, the management of public urban transport, and sustainable public urban transport, by means of one of the most important databases: Web of Science. The purpose of this research is to identify the relations and correlations on the conceptual map. I carried out a qualitative-interpretative research based on a bibliometric approach through the VOSviewer application.

The results of the qualitative research (from the bibliogarphic research) were used by the bibliometric analysis effected through the VOSviewer software. By means of this software I analysed and observed concepts, ideas, and findings common in specialized literature on the management of the public urban transport, which were found in articles in the Web of Science database and then displayed as a visual map.

The present research identified 6 clusters, represented in different colours. The clusters are words grouped around a common concept.
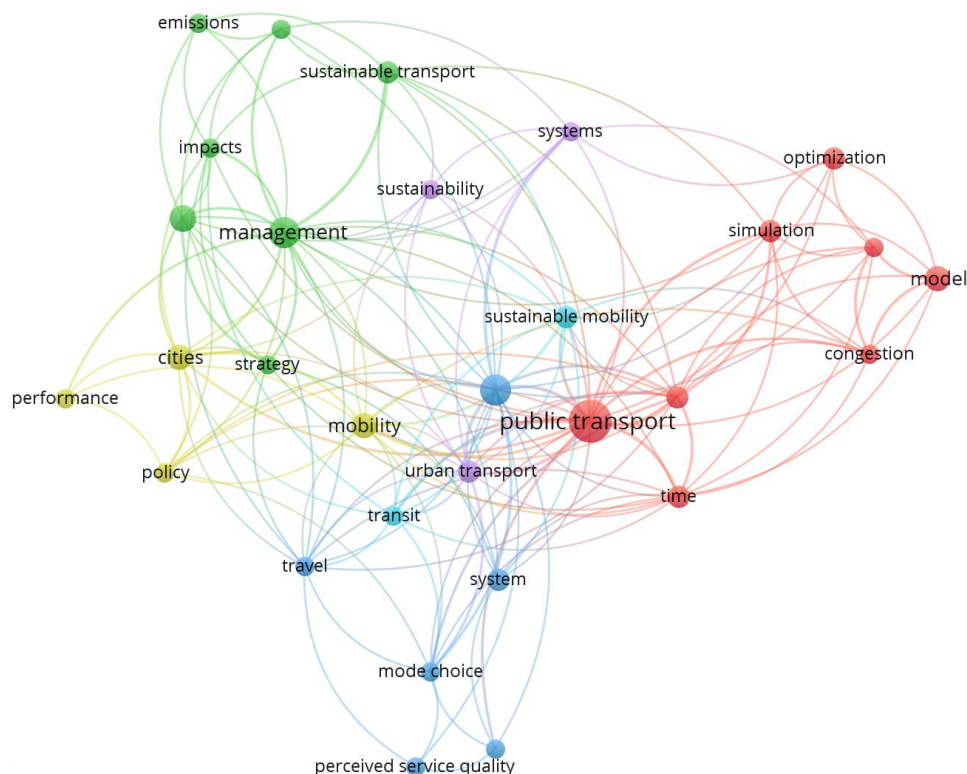

Figure 1. Visualisation of network through the VOSviewer 1.6.19 software - Web of Science database. Source: our own processing

The purpose of this research is to make a detailed analysis by means of prestigious databases in order to introduce three key concepts of the PhD thesis: (1) management, (2) management policies and strategies, and (3) sustainable public urban transport. The initial findings were consolidated and supported by means of a qualitative research tool, allowing for text analysis, i.e. the VOSviewer software for bibliometric analysis.

This qualitative research leads us to conclude that it is important to set up relevant management policies that take into account the public needs and environmental sustainability. Also, the connection between the key words identified were identified in the published articles, so that we noted the close connection between management and the durable public urban transport, mobility and the population's demands, management strategies and policies.

The results of this research took the form of discovering the most important aspects on the map of management in the transport sector, analyzing at the same time the manner of their perception, documentation, and analysis by authors in specialized literature. This qualitative research has a crucial role in the structure of the PhD thesis, as it works as a simple but effective method used to comprehend the manner of choosing and connecting the key concepts at a very minute level. Besides, by means of this bibliometric research performed by means of the VOSviewer software, we can evince novelty elements which may improve the already existing publications.

CHAPTER 2. THE CURRENT FRAMEWORK FOR URBAN PUBLIC TRANSPORT IN ROMANIA

Urban transport system

The social and economic development of a city is strongly influenced by the degree of development of the existing infrastructure. Sustainable economic development, the performance of the region's economic activities and the social activities carried out are largely influenced by infrastructure. Transport infrastructure can only develop if significant investment is made at the national level. Modern infrastructure ensures workforce movement without risking the depopulation of small, underdeveloped towns or villages at a great distance from the population's places of work.

Thus, the urban public transport development strategy must take into account the possibilities for improving existing infrastructure and setting a level of urban infrastructure development in certain areas that require changes in light of realistic objectives. Our country needs to align itself with European Union standards and make transport infrastructure an essential anchor. In 2019, a study was published by the European Commission which looked at the level of investment in transport infrastructure in 2016, with a percentage of GDP invested of 1.7%, the highest in the EU. However, in terms of the motorway network, Romania ranks last in Europe.

The degree of development of urban public transport infrastructure depends on both the country's development and the intensity of economic activities. Transport infrastructure and road safety are poorly developed despite substantial investment in recent years. National roads and motorways account for about 20% of the road network, and one-way national roads account for 90% of the road network in Romania. This has a significant negative influence on road safety and travel time. Compared to EU countries, the number of kilometres of motorways built and their completion rate is extremely low. According to the NSI, the length of public roads made up of the national, county and municipal road network in 2019 recorded only 86,391 km.

In the southeastern part of Romania, the road infrastructure is not very well developed, and it highlights the peripheral character of the region. In 2019 of the total public roads, 20.8% are national roads, 41.8% are county roads and the remaining 37.4% are municipal roads. Between 2010 and 2019, 251 km of roads were built in the South-East region, with the network in the region increasing from 10 763 km in 2010 to 11 014 km in 2019. In the period 2010–2019, the public road network in the South-East region was upgraded. In 2010 there were 2 537 km of upgraded roads in the South-East region, and in 2019 the number increased to 4 809 km. The roads have been upgraded as follows: in Buzău 760 km, in Brăila 363 km, and in Galați and Vrancea 347 km.

However, there are still a large number of unmodernised public roads, only paved, with a slight downward trend. So, from 2010, when there were 3,760 km of unmodernised public roads, in 2019 they have decreased to 2,426 km, which shows the low commitment to modernising road infrastructure. Unmodernised or dirt roads have a significant negative influence on the environment and do not allow people to move at full capacity.

Romania's public roads can be considered acceptable, but major investment is needed to improve them. The condition of the roads, their length and the density of the national road network contribute to social and economic development in every region of the country. Urban public transport plays a key role in the overall development of a city.

In the southeast area, public transport is frequently used by the population by bus and minibus. The situation of the means of urban transport in 2019 in the South-East area was as follows: 765 buses, 26 trolleybuses and 63 trams. According to county statistics in 2019, in the southeast area, the tram is used only in Galati and Braila, although it is an efficient transport alternative, as it has multiple advantages for both the population and the environment, allowing the transport of a large number of people and also being a sustainable means of transport.

The road infrastructure in southeastern Romania does not offer significant accessibility at the moment, the best available options being the Bucharest–Constanta motorway and the suspension bridge in Braila, which could attract many national or international investors in the future. Investments in infrastructure are necessary in the city because they must meet the needs of citizens and ensure a better standard of living.

A large number of urban public transport means contributes to smoother traffic flow, shorter journey times and less pollution. Thus, road infrastructure has both a direct impact on road travel time and an indirect impact on the mobility of people, especially the workforce. Large companies usually give up the idea of investing in areas where the workforce is harder to access due to poor infrastructure.

Road infrastructure has been improved over the last 10 years, but much more investment is needed to ensure the mobility of the population, connectivity with the socio-economic environment and increased economic performance at the national level. Our country needs to benefit from a modern and safe road network in order to align with the other European Union countries, which promote a sustainable and efficient transport model. Thus, the solutions are policy measures to make trade links and economic relations more accessible both with EU countries and our neighbours. Only in this way can the national road network meet EU standards and respond efficiently to traffic conditions.

2.2. SWOT analysis applied to transport in Romania

SWOT is an acronym for S (strengths), W (weaknesses), O (opportunities), and T (threats). SWOT analysis is a technique applied at the level of an organisation, a sector of activity or an area of interest to identify the internal situation (strengths and weaknesses) and

the external situation (opportunities and threats). Knowing the situation of the field under analysis allows one to establish effective strategies to achieve the proposed objectives by planning well-informed decisions.

Table 1. SWOT analysis. Source: own processing

Strengths	Weaknesses
1. Competent and responsible staff 2. Low costs for skilled workforce 3. Increased industry interest in urban public transport due to increased attention of companies to environmental protection 4. Purchase of a large number of modern public transport means 5. Tram infrastructure under development and modernisation 6. Modern fleet of buses and trolleybuses 7. Application of active management, focused on achieving priority objectives in development and modernisation	1. Strategic planning is not well processed 2. Lack of correlation between strategic objectives and budgetary programmes 3. Action plans are not sufficiently developed to be put into practice 4. Lack of motorways and poor development of the expressway network 5. Poor transport infrastructure 6. Lack of road connections to intermodal terminals to ensure attractiveness to potential beneficiaries of intermodal transport 7. Poor promotion of intermodal transport use 8. Poor coordination between transport modes 9. The very poor quality of many road rehabilitation and upgrading works 10. Lack of bypasses for many large cities crossed by busy European or national roads 11. The rather low access of people with reduced mobility to urban public transport
Opportunities	Threats
1. Applying risk-based management as a performance standard 2. Implementation of national road transport modernisation programmes 3. Implementation of effective urban development strategies and sustainable urban mobility plans 4. The existence of intelligent systems to monitor urban traffic and make intermodal transport more efficient 5. Existence of projects to expand and modernise regional transport infrastructure 6. Implementation of programmes to reduce pollution from road transport 7. Stronger involvement of local public authorities in modernising public transport infrastructure 8. Increased investment in the modernisation of transport infrastructure and related services with a favourable impact on social development and facilitating better social inclusion 9. Programmes to access European funds for building modern roads and rehabilitating existing ones	1. Manifestation of institutional instability (frequent reorganisation of structures through merger, division, change of mandate or tasks) 2. Declining trend in the use of urban public transport in favour of the personal car 3. Low take-up of EU funds 4. Delays in the implementation of priority infrastructure projects 5. Public reluctance to use urban public transport 6. Exceeding deadlines for project preparation, preparation of various feasibility studies 7. Decreasing public interest in public transport 8. Failure to adapt transport infrastructure to existing demand

Following the SWOT analysis, we identified that a WO type strategy, also known as min-max strategy, can be applied to reduce weaknesses by using existing opportunities. In this way, by attracting the necessary financial resources and making efficient investments in transport infrastructure, weaknesses can be eliminated. It is necessary to implement a national programme for the efficient construction of a road network and the modernisation of existing roads. The population will also understand the importance of using urban public transport if a coherent and relevant promotion programme is carried out, making them aware of the advantages obtained, both personally and for the environment by protecting it.

2.3. Key EU policy objectives for the transport sector

Transport is a strategic sector in the economy of the European Union. At the same time, it has a direct impact on people's daily lives, ensuring the movement of both people and goods. A well-designed, sustainable and efficient urban public transport network is the basis for a well-functioning Europe. Well-organised urban public transport systems form the cornerstone for successful European integration.

Only by exploiting the economic strengths of EU countries and building a favourable transport infrastructure can socio-economic and territorial cohesion be promoted. Transport services are closely linked to key areas such as the environment, the economic situation, the socio-cultural environment, the digital environment or the employment situation, both at the European and global levels.

Transport policy in the European Union is laid down in the Treaty on the Functioning of the European Union (TFEU), in which the EU declared its desire to create a common market so as to open up transport networks and establish freedom to provide transport services. The white papers are key documents needed to define the objectives of EU transport policy. They are published every five years. A major objective is the creation of a single European transport services area, allowing for a competitive and highly organised system taking into account the available resources.

Transport sector-specific strategic and policy documents develop the priorities set out in the White Paper in terms of analysing transport modes both individually and from a cross-cutting perspective. TEN-T is the Trans-European Transport Network which allows the development of an integrated multimodal network. According to TEN-T, the network should allow the fastest and easiest movement of people and goods across the European Union. European projects aim to plan measures covering all modes of transport, taking into account the facilitation and control of the development of the transport sector coordinated through the TEN-T network. The comprehensive transport network is intended to ensure the accessibility of the regions of the European Union and connectivity with other regions.

Transport is an area of major importance and EU countries need collaborative skills in this sector. Member countries can therefore establish and adopt binding measures and acts to regulate the transport sector from a legal point of view. Member States can vote and adopt common rules, laws and policies in the transport sector. Stakeholders in this service sector are local, regional and national authorities with powers in transport policy and the necessary transport investments. The result of these interactions is a service that benefits millions of people and many businesses. Development activities, infrastructure construction and the financing of various transport projects are carried out by the EU Member States. EU funding sources can generate European added value by acting as a catalyst covering only part of the total needs.

The level of infrastructure development in the European Union is still poor and its quality needs major improvement. In Eastern Europe, the number of motorways and railways is much

lower than in Western Europe. The relevant objectives and priorities must, therefore, be matched with the available transport resources. In the long term, the aim is to build the remaining infrastructure and strengthen the existing one.

2.4. Management strategies for transport infrastructure development in Romania

All investment in transport infrastructure must be guided by a strategy for the development of the whole sector. It is also necessary to identify the factors influencing the quality of the transport infrastructure development strategy, so that the strategy is stable over time, sustainable, financially balanced and with low environmental impact. In addition, the implementation of the strategies takes into account priorities, policy changes aimed at reducing the large gap between socially perceived funding needs and existing funding sources.

Well-organised transport infrastructure enables sustainable economic development and has a long-term impact on various sectors of the national economy. Without the existence of a basic transport infrastructure, investments in smart actions cannot be made. Poor transport infrastructure can be identified by reduced mobility, insufficient connectivity in some regions, long waiting times at border crossings, traffic congestion, etc.

Compared to EU countries, Romania's transport infrastructure remains poor. There is a need for a correlation of documents concerning the transport infrastructure programming process, so that there is coherence and efficiency. An important step in the process of infrastructure development is to establish precisely the financial sources available for investment for all modes of transport. A realistic investment plan must be drawn up that can meet national and European connectivity needs.

The strategic objectives for transport infrastructure development are: economic efficiency, sustainability, safety, economic development, etc. The transport system must be well designed and efficient for both transport operations and users. Sustainability must be economic, financial and environmental. The aim is to promote environmentally friendly, energy efficient and low carbon modes of transport. Another extremely important strategic objective is road safety, which can be achieved by reducing accidents.

Measures aimed at supporting a sustainable transport network must be well supported so that all efforts are focused on ensuring synergy between all the actors involved and with responsibilities in the field. It also aims to establish effective financial and fiscal policy measures aimed at fuelling with alternative fuels and supporting low carbon vehicles. Specific measures to increase urban mobility are:

- regulating and implementing green charging principles;
- discouraging people from using their cars in favour of urban public transport;
- applying European Union green public procurement criteria;
- raising additional revenue for the maintenance and development of sustainable transport infrastructure;
- expanding electric vehicle charging infrastructure.

The road network must connect the development regions with the economic growth poles and socio-demographic centres of our country. The urban road network is considered to be the engine of a country's economic development because it contributes to boosting investment, generating multiple benefits for both the population and the environment. The new environmental policies regulated at European level on road transport must be included in the strategic vision on sustainable development, as a well-harmonised strategic and legislative framework leads to the achievement of established medium and long-term objectives.

2.5. Conclusions

The urban public transport infrastructure in our country still needs major improvements, even though various modernisation processes have been carried out in recent years. Only through a well-structured management plan can the connectivity and mobility of the population be properly ensured. Both sustainable mobility and connectivity of the transport sector with other important areas of society contribute to economic and social development. The southeastern part of the country allows for transport development due to its geographical characteristics, so that it is easy to improve the transport sector with special strategic measures. By applying well-structured management strategies, it is possible to provide quality services and, over time, to bring them into line with the European standard of services.

The state of infrastructure at the national level is considered acceptable, referring to both main national roads and motorways, but major investments are still needed. Both the condition of roads and their length have a significant impact on national socio-economic development. Moreover, the density of the road network contributes to attracting various investors. Thus, the level of socio-economic development of a city depends directly on the degree of development of the transport infrastructure. Promoting a sustainable economy and increasing the competitiveness of a country's economic activities are factors that depend directly on the transport sector.

Also, most social activities depend on transport infrastructure, so Romania needs to be anchored by all means to the development requirements of society. Efficient management plans can provide the necessary investments to ensure that the mobility of the population in our country is of the highest quality. The country's economy is constantly developing, we have seen a particular evolution in recent years, so Romania must meet all the requirements and expectations of the population in terms of modernisation. By improving the transport infrastructure, all commercial and economic links are made more accessible, as infrastructure is an integral part of a country's economy.

CHAPTER 3. URBAN PUBLIC TRANSPORT REHABILITATION IN GALATI MUNICIPALITY – A BRIDGE TO SUSTAINABLE TRANSPORT

3.1. Urban transport - legal framework and conceptual delimitations

Urban transport, i.e., local public passenger transport, is, according to Regulation (EC) No 1370/2007 of 23 October 2007 on public passenger transport services by rail and by road, one of the services of general economic interest among the common values of the European Union.

The proportion of Europe's population living in urban areas is expected to increase from 73% in 2010 to 82% by 2050. In the meantime, European cities need to improve mobility and reduce congestion, accidents and pollution through local mobility policies. Local public passenger transport is characterised by several specific elements:
- it is a social utility service;
- it is in permanent contact with government institutions and local government authorities;
- it provides services of collective and general interest.

This service operates on the basis of **two fundamental principles**:
1. *continuity* – regardless of socio-political conditions, this service must operate non-stop, it must satisfy public interests continuously;
2. *the general interest* – must take precedence over the private interest.

For this public service to function properly in a city, in the spirit of the two fundamental principles, it is necessary to ensure:

a) traffic organisation (management);
b) specialised staff;
c) the infrastructure and vehicles to acceptable standards;
d) adequate financial resources.

At present, the under-use of public transport is mainly due to shortcomings in project design and mobility policy. Several of these shortcomings could be addressed by the development of an urban mobility plan that sets out public transport deficiencies, short- and long-term objectives to optimise transport routes, accessibility for the population and continuous fleet improvement.

The concept of sustainable transport is an extension, a projection into the future of public transport. Public transport is practically the backbone of sustainable urban transport and contributes to a high degree of social inclusion. Therefore, support from public authorities is often a necessity, as they have an obligation to support the transport operator in organising and providing public transport to high standards. Thus, all major projects, at local or regional level, will have to demonstrate their contribution to the objectives set at programme level to promote sustainable multimodal urban mobility.

3.2. An overview of the sustainable development strategy

The area of the administrative-territorial unit of the Municipality of Galati stretches in the South-East of Galati County, in the South-East Development Region of Romania. In order to develop a mobility strategy in the municipality of Galați, the increased homogeneity in terms of social and economic development, transport development (including the public transport system) and land use considerations must be taken into account.

Urban functional area of Galați Municipality (which includes Smârdan, Șendreni, Vânători, Braniștea, Frumusița, Tulucești, Independența, Slobozia Conachi, Foltești, Piscu, Măstăcani, Fundeni, Costache Negri, Pechea, Schela, Cuza Vodă, Tudor Vladimirescu, Scânteiești, Cuca, Băleni, I. C. Brătianu, Grindu, Vădeni, Jijilaj) cannot constitute an area for the elaboration of a homogeneous strategy, as there are major differences in the degree of socio-economic development of these communities compared to the municipality.

Also, there is no local public transport system in these communes, and the routes in the Municipality of Galati do not exceed the limit of the administrative territory, not reaching the whole urban functional area defined above.

3.3. Objectives in developing a sustainable transport development strategy

The strategy for the development of public transport in the Municipality of Galati aims to achieve the following **fundamental objectives:**

- **Accessibility** – the transport and mobility system will facilitate access to destinations where essential activities take place for all categories of users;
- **economic efficiency** – the transport and mobility system will continue to support economic activities in Galati in conditions of sustainable development;
- **safety** – the transport and mobility system will aim to reduce the number of road accident fatalities, particularly among vulnerable road users;
- **protecting the environment** – the transport and mobility system will aim to reduce negative environmental impacts (emissions of pollutants, greenhouse gases, noise);
- **quality of life** – the transport and mobility system will be geared towards meeting

the above fundamental objectives, contributing to sustainable urban development and increasing the quality of life in the municipality of Galati.

By setting these target objectives, it aims to develop urban transport today into a sustainable transport that*:*

- is affordable and meets the basic mobility needs of all users;
- means balanced development and better integration of different modes of transport;
- meets sustainability requirements, balancing the need for economic viability, social equity, health and environmental quality;
- optimises efficiency and cost effectiveness;
- make better use of urban space and existing transport infrastructure and services;
- improves the attractiveness of the urban environment, quality of life and public health; improves traffic safety and security;
- reduces air and noise pollution, greenhouse gas emissions and energy consumption;
- contribute to a better overall performance of the trans-European transport network and the European transport system as a whole.

The mobility of people and goods is the result of the global development we face. The city of Galati has undergone major social, cultural and economic changes in recent decades that have clearly influenced mobility patterns. Factors such as income growth, development of consumer markets, emergence of new jobs, and increase in the motorisation rate are generating continuous challenges to meet new mobility needs.

The development of a strategic plan for the development of sustainable transport is aimed at building a development vision for the Municipality of Galati, to ensure its quality as a model city in terms of sustainability. The aim is to change citizens' travel behaviour by correcting deviations, so that they can regain their urban territory, which is currently largely dedicated to cars.

3.4. Policies and measures to implement the sustainable transport development strategy

a) **Major interventions on the road network** – with a view to developing sustainable transport, several measures are to be implemented in order to ensure improved circulation as a result of the distribution of traffic flows, increased territorial accessibility and reduced external costs.

b) **Alternative means (systems) of mobility** – measures to increase the attractiveness, safety and security of walking and cycling. The development of new cycling infrastructure and pedestrian routes considers other options than those along motorised transport routes. With the aim of increasing traffic safety, information and communication campaigns are proposed to all traffic participants on how to use public transport spaces preventively and shift to sustainable modes of transport (cycling). Emphasis will be placed on the training of drivers in preventive behaviour towards cyclists in traffic.

c) **Traffic management** – a key element of urban mobility planning, traffic management supports decision-makers in achieving their objectives and managing traffic operations, while helping end-users, citizens, by presenting sustainable mobility options.

d) **Intermodal structure and necessary urban planning operations** – ensure better integration between available transport modes.

Conclusions

Sustainable urban public transport has become an important concern for major cities

around the world. So, our country has also understood that a well-defined strategic plan is needed to eliminate the negative effects of pollution caused by the transport sector, while improving the quality of services provided. Moreover, it must be clear that rapid urbanisation has a direct impact on sustainable development.

The negative environmental effects of urban transport must be reduced as quickly as possible or even eliminated, as the impact on the environment and society as a whole becomes a threat to global sustainability. Limiting the negative effects of the transport sector has become an integral part of sustainable development. The demand for urban public transport has increased significantly in Romania over the last ten years due to rapid urbanisation and economic development of cities. But accelerated urbanisation has led to an increase in the number of cars and deterioration of road infrastructure. The travel behaviour of citizens directly influences the development of urban public transport, as increased demand for this public service will limit the effects of pollution.

Buses are considered the most important means of urban public transport with limited environmental impacts. The management strategies are designed to apply principles that support high accessibility of the population to different quality and efficient services. Urbanisation must be carried out in an appropriate way to be part of sustainable development plans. The rapid and uncontrolled growth of the vehicle fleet, coupled with the high stock of used, ageing and less maintained vehicles, has degraded the road infrastructure, leading to road congestion, air pollution and high noise levels.

All these aspects highlight the importance of development based on an effective management plan. The negative effects caused by the transport sector have affected environmental conditions, particularly in urban areas, and in the long term may also have consequences for quality of life.

The role of management in the transport sector is becoming indispensable because it requires detailed planning, relevant and effective strategies and a plan that includes all the steps to achieve a sustainable society. The management plan aims to develop a sustainable transport infrastructure, shape transport policies that make socio-economic development goals more effective, promote social equity and environmental stewardship, and ultimately enable transport systems to be used optimally.

The adoption of a relevant management strategy aims to decrease motorization, combine appropriate traffic management actions, eliminate worn-out buses and properly plan land use and urban public transport. Sustainable development is achieved with the aim of conserving all the resources that humankind needs and without which there is no future. Moreover, sustainable transport is considered an integral part of sustainable development in society. The role of management is crucial in this sector, as without systematic planning of the whole activity the desired results cannot be achieved.

CHAPTER 4. URBAN PUBLIC TRANSPORT STRATEGY IN GALATI MUNICIPALITY

General aspects

Transport is one of the major sources that can negatively influence the quality of the environment. The main harmful factors associated with the transport process and related activities are noise, air and water pollution. Urban traffic generates 40% of CO_2 emissions and 70% of other pollutant emissions from motor vehicles, and traffic congestion, concentrated

mainly in metropolitan areas, costs the European Union (EU) approximately 1% of GDP. The problem of urban congestion must be tackled more ambitiously, with due regard for the principle of subsidiarity, by implementing a cooperation and coordination strategy at European level.

An effective urban mobility policy must take into account both passenger and freight transport and be based on a comprehensive approach that brings together the best solutions for each problem. In urban areas there is adequate economic potential for modal shift policies in favour of public transport, walking and cycling. There is a need to promote technological innovation, better use of existing infrastructure, optimising the integration of urban freight flows and optimising the use of private cars.

The economic and demographic development of Galati has led to an increase in traffic in the city, which is manifested by the congestion of traffic arteries. This poses problems for the city in terms of satisfying travel needs (safety, speed, comfort, economy and environmental protection).

For sustainable transport in the municipality, a traffic management strategy is currently being implemented, structuring a database with multiple and detailed accessibility according to the city's urban problems, accompanied by traffic optimisation programmes, implementation of intelligent transport systems (ITS), in line with European requirements, on ensuring sustainable urban mobility that meets current traffic requirements. The implementation of a new sustainable transport policy in the city of Galati, including the implementation of ITS systems, will be an alternative to meet the growing traffic demand.

Galati, together with Braila, are the only first-tier cities in Romania that are not directly connected to the TEN-T Core (Central) road and global priority axes crossing the country, although they have a strategic position, being the only gateway to the southern part of Ukraine and the Republic of Moldova. Nevertheless, Galati is part of the global road and rail TEN-T network, which will link Romania to the former Soviet area, a market with great potential for development. An important step in this direction has already been taken, with the completion of the first standard gauge railway segment in the Republic of Moldova, which allows rail traffic of people and goods between the cities of Galati and Giurgiulesti.

In addition, the city is the most important Romanian river port on the Danube, which is the main water transport axis of the European TEN-T network. Therefore, its prospects for improving its accessibility in the international context are closely linked to the development of transport on the Danube and the assertion of its competitive advantage of being the largest river port in Romania with rapid access to the Black Sea.

4.2. Aim of the sustainable urban transport strategy

In order to grow, any urban community must promote a strategy based on projects and operational programmes that operate within a coherent and coordinated framework at all levels of public administration. The sustainable transport strategy must aim to continuously improve the quality of life by achieving a modern transport system both economically and socially sustainable. The strategy of the Municipality of Galati for the 2014-2024 period aims at restructuring and modernising the local public transport activity in order to carry out an efficient activity with non-polluting means of transport (trolleybuses, trams and electric buses) and to satisfy the passengers' needs.

Local public transport in the Municipality of Galati aims to ensure easy access for passengers to:
- Industrial platforms: (West platform including Liberty Steel, Industrial Park II, other companies and East platform: DAMEN, Industrial Park I, Free Zone, Port Docuri);

- hospital units (Emergency Hospital, Infectious Diseases Hospital, Pneumo-phtisiology Hospital, Elisabeta Doamna Hospital, CFR Hospital);
- school establishments: (universities and colleges);
- public institutions (City Council, County Council, etc.);
- commercial areas of local interest;
- recreational areas.

Another aim of the sustainable transport strategy is to create a suitable framework for attracting non-reimbursable funding sources and successfully implementing the proposed new projects. This includes:

➢ drawing up and monitoring a mobility plan for the municipality of Galati;
➢ implementation of a computerised system (e-ticketing) to ensure accurate quantification of revenue and passenger flows in order to base investments.

The main objectives of Galați's strategy for the development of sustainable urban transport in the 2014-2024 period are:

✓ improving the efficiency of the local public transport operator's work by increasing existing performance;
✓ increasing existing performances and bringing them up to European standards (number of passengers carried annually, the time span between vehicles, fare system, passenger information systems, etc.);
✓ reconsidering operating and maintenance costs by implementing measures to control them, such as: introducing fleet-wide monitoring systems integrated into urban traffic monitoring systems in general;
✓ introducing modern systems for collecting revenue from travel tickets

Another objective of the transport strategy is mainly aimed at maintaining the quality of urban local public transport service by improving the following indicators:

- reducing operating costs;
- reducing energy consumption;
- reducing chemical and noise pollution;
- upgrading infrastructure;
- modernisation or replacement of the vehicle fleet.

4.3. Action lines to implement the transport strategy

In order to implement the sustainable transport strategy in the municipality, the following types of actions are targeted:

✓ **Short-term actions - 1 year**
a) priority infrastructure works, street rehabilitation with water drainage, sewerage system rehabilitation, and boulevard widening.
b) investment in urban transport;
c) actions to reform the institutional and operational framework;
✓ **Long-term actions - 7 years**

- purchase of 20 trolleybuses with European funds + local budget co-financing;
- purchase of 40 electric buses including related equipment for transport in neighbourhoods (European funds + local budget co-financing);
- update and extension of the e-ticketing system for the automatic distribution of compensation due to transport operators;
- additional sources of revenue to ensure the maintenance of projects;

- introducing an additional transit tax of the municipality of Galati for vehicles over 3.5 tonnes;
- introducing a tax for local logistics companies;
- introduction of a surcharge from the 5th day of use of the public domain for works;
- concessioning of newly created car parks following the implementation of new projects.

Maintaining the social character of urban passenger transport – the social component that characterises urban passenger transport must be a basic concern of local government. This concern is driven by the fact that the public transport service is currently used primarily by middle- and low-income groups. Maintaining social character requires:

1. affordable fares, by subsidising the fare difference from the City Council budget;
2. free transport tickets for certain categories: war veterans, disabled people, etc. and their subsidisation from the local or state budget;
3. reduced-price tickets: pensioners, students, pupils, etc. and the difference in price to be paid from the local budget.

Measures to make urban transport more efficient:

- optimising local transport to best meet the needs of citizens, including by extending transport routes on new routes and carrying out a study of passenger traffic by journey and route in order to match the capacity of public transport with passenger flow;
- achieving an appropriate density of line networks so that walking distances to a bus stop are kept as short as possible, in order to encourage more trips by local transport rather than by car;
- optimising public transport by installing tracking and monitoring systems at the main stops to inform passengers promptly about the progress of the means of transport;
- modernising bus stops by installing covered passenger shelters at all boarding points;
- developing a medium-term (2024) and long-term (2030) road infrastructure plan presenting a coherent strategy for the maintenance and management of roads and related infrastructure in line with sustainable mobility policy and urban development strategies;
- improving the urban-interurban transport by setting up bus stops at the two entry points to the city (Tecuci and Vânători);
- establishing a Traffic Control Centre that can monitor traffic conditions and act in the event of congestion or incidents;
- developing transport infrastructure (streets, trolleybus/tram lines, power supply and recovery stations);
- building dedicated bus lanes – exclusive lanes for public transport;

- establishing a parking policy, promoting Park and Ride schemes (car parking and continuing transport using public transport);
- creating a road hierarchy, a network of main roads to facilitate the flow of traffic and avoid freight transport in the city area.

Safety measures for passengers and other road users:

- ✓ Maintaining, expanding and updating the urban transport model and related databases for the Municipality of Galati on a regular/continuous basis to continuously consider urban, socio-economic developments and the impact of the implementation of national transport projects;
- ✓ upgrading and extending the traffic light system for 35 crossroads and 26 pedestrian crossings**.**

Measures to reduce air pollution, noise and CO_2 emissions:

- raising awareness among the population and local public authorities about reducing greenhouse gas emissions by using public transport;
- modernizing the fleet of S.C. TRANSURB S.A. Galați through the purchase of low-pollution urban buses (Euro 6);
- implementing a pilot project by converting buses into environmentally friendly means of transport - equipping them with LPG fuel installations;
- expanding low-emission zones and creating new pedestrian zones;
- implementing an integrated road traffic management programme in Galati;
- extending the trolleybus lines in the municipality and purchasing rolling stock;
- rehabilitating the tram lines and modernising the existing tram wagons;
- purchasing electric buses including related equipment for transport in neighbourhoods.

4.4. Investment plan supporting the strategy

The investment plan required to implement the transport strategy is drawn up in accordance with the studies carried out, taking into account their conclusions. The proposed sources of funding are mostly European funds, with co-financing to be provided by the local council, and investment loans. If it is not possible to absorb 100% of the European funds, with consideration to the current needs of the local transport company, usable funding sources must be identified immediately.

Conclusions

The quality of urban public transport services has a direct influence on the increase in people's willingness to use them. In addition, increasing the number of users of the public transport system leads to increased revenues, which can then be used to improve the whole system. At the same time, improving the urban public transport system is the best strategy to promote public services. This requires both a well-developed and relevant management plan for sustainable transport and a marketing and communication strategy to promote the benefits of urban public transport. Adopting sustainable principles among the population is part of the urban mobility management programme.

The sustainable development management programme involves measures to reduce the use of private cars and increase the use of urban public transport, which promotes urban mobility. The aim is to encourage the population to voluntarily switch from using their private car to urban public transport, in other words, to choose a sustainable mode of transport. Urban public transport is essential for economic activity. Transport analysis involves researchers trained in many disciplines, including engineering, economics, geography, planning and marketing. The lack of sustainable transport and inadequate land-use planning indicates that development projects are implemented by different departments without considering urban ecological systems, available resources and socio-economic factors.

The development of a sustainable urban transport system must become a priority, so concrete measures and an effective management plan are needed to help achieve the objectives set. Urban transport policies are formulated with the aim of clarifying the status of funding sources for transport infrastructure development. In addition, optimal transport planning, operation and analysis of transport systems are part of the management process. Management planning is aimed at maximizing the efficiency of the urban transportation system to address environmental constraints and the optimal use of city resources.

CHAPTER 5. SURVEY ON PASSENGER SATISFACTION WITH THE TRANSURB S.A. GALATI TRANSPORT SERVICE

Sampling and representativeness

The sample analysed contains 1136 subjects, selected by randomisation. The assumption of randomisation is fulfilled by the fact that the selection of participants was carried out on an ad-hoc basis, based on their voluntary attitude towards participation in the research, in the context of the popularisation of the option of participation through social media channels. The population served by the transport system analysed in the municipality of Galati is approximately 230,000 individuals and is made up of residents and tourists. Given that a significant percentage of inhabitants do not use public transport, the transient population for purposes other than tourism can also be included in this approximate population.

The sample has a sufficiently large number of subjects for the proposed research and modelling objectives. A brief survey (power analysis, probability of type I, II errors) indicates a limitation on the effectiveness of increasing the number of subjects relative to the marginal increase in the accuracy of any analyses or tests: the number of subjects is favourable.
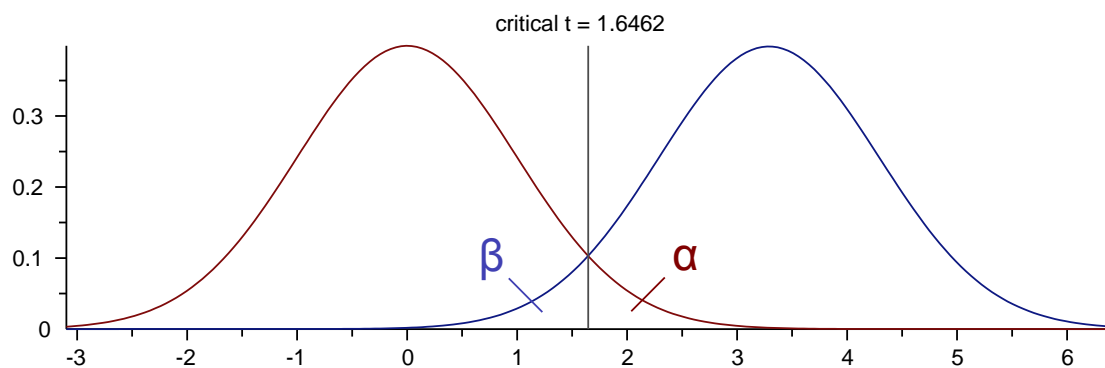

Figure 2. Type I and II error probabilities for the selected sample. Source: own processing

The *point-biserial* correlation coefficient mentioned in the test below refers to the Pearson correlation coefficient when at least one variable has dichotomous values (only two possible values) and is a necessary preliminary step in the analysis of interval-scored items (even with more than two possible values) or in cluster analysis. The probability of a type I error (in the test, "α err pro") and type II error (in the test, indirect, power analysis, 1-β.

t tests - Correlation: Point biserial model
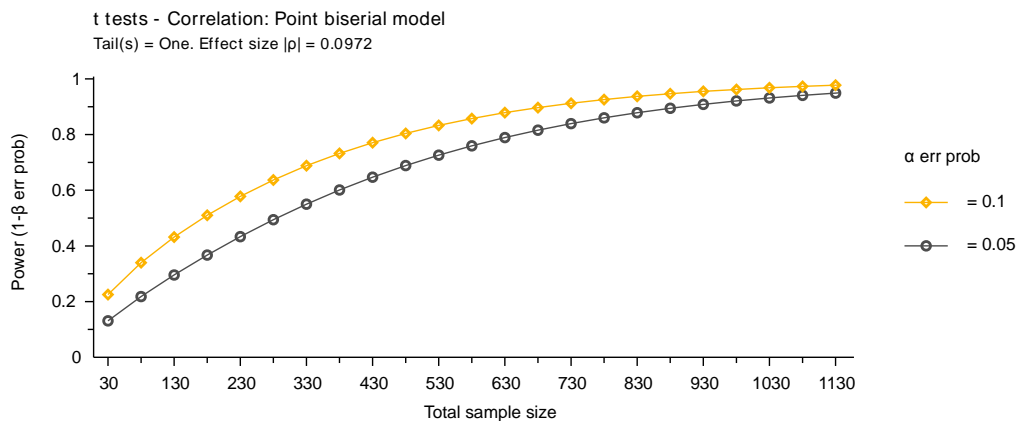Tail(s) = One. Effect size |ρ| = 0.0972

Figure 3. Analysis of sample size in relation to type I and II errors. Source: own processing

Research aim and objectives:

- measuring satisfaction and safety;
- identification of the passenger profile;
- assessment of the comfort of the journey;
- measuring the regularity, speed, rhythm and punctuality of public transport movements;
- assessing the quality of public transport services;
- improved passenger traffic management.

5.2. Operationalisation of the applied questionnaire and item coding

At this stage, I have organized the measurement tool and showed how its elements can be composed into variables or indicators so that the research objectives be achieved through a targeted structure, such as logically constructing the argumentation of research conclusions and inferential statistics elements that can extrapolate or extend the results of the current research, carried out on a selection, a sample, to the whole population studied. The basic element of the research instrument used is the questionnaire, whose items are presented, together with the response variants and the associated indicative interpretative scale.

5.3. Coding of questionnaire items

In the following table, I present the relationship between the items in the questionnaire and their abbreviated names, which makes it easier to process the data statistically and to illustrate the results.

Table 2. Coding of items in the questionnaire. Source: own processing

Coding	Explicit version of the item
fv-travel	How many days a week do you travel by public transport in Galati?
Season ticket holder-non holder	Are you a public transport season ticket holder in Galați?
Purpose of using public transport	What is the main purpose for which you use public transport in Galati?
a-safety	Rate the level of safety on public transport in terms of crime-related safety.
a-regularity	Assess the frequency of public transport in Galati.
a-punctuality	Assess the punctuality of public transport in Galati municipality
a-comfort	Assess the comfort of travelling by public transport.
availability	Do you consider that the number of means of public transport in Galati meets the needs of the population?

q-driver	How do you rate the attitude/behaviour of public transport drivers in Galati?
q-ticket collector	How do you rate the attitude/behaviour of the public transport ticket collectors in Galati?
q-info	Are you satisfied with the information about public transport provided by TRANSURB S.A. Galați?
q-e-ticketing	Are you satisfied with the new e-ticketing system provided by TRANSURB S.A. Galați?
p-future	Is there any important aspect that should be improved in the TRANSURB S.A. Galați activity?
a-integral	Rate on a scale of 1 to 10 the services provided by TRANSURB S.A.
educational level	The respondent's graduated studies
resident	Are you a resident of Galati County?
gender	Gender of respondent
age	Age range of respondent
profession	Occupation of respondent

5.4. Operationalisation of questionnaire items

The items in the questionnaire were operationalised in order to determine, by modelling the answers given by the subjects, values that can provide a result whose interpretation constitutes a significant benchmark for achieving the research objectives.

a) Socio-demographic items

The quality of the subjects with reference to the possession of a season ticket, the level of education, the purpose of the trip, the quality of inhabitant of the municipality of Galati, gender, age, and profession, are essential sociodemographic landmarks to identify the profile of the passengers, which is why they are mentioned in a separate category, that of sociodemographic items.

The quality of the subjects (season ticket holder/not-holder) is a sociodemographic item specific to the objectives of the present research, with a significant impact on the analysis of the answers given, since we can presume that the choice of being a season ticket holder implies a certain degree of satisfaction with the services offered, a certain level of appreciation for the comfort of the journey.

Being a resident of Galați is an essential element in modelling respondents' satisfaction because we can assume that residents of Galați have more frequent contact with the public transport system, either as passengers, pedestrians or participants in traffic by other means (bicycles, personal car, taxi, etc.).

The importance of aggregating data on the actual need for season tickets is also due to an essential aspect of public transport management: the resources dedicated to public transport can best be estimated on the basis of the total number of season tickets in the population served by public transport.

b) Measuring satisfaction and safety

The degree of satisfaction of the respondents is measured by composing the values recorded for the assessment variables: *a-regularity, a-punctuality, a-comfort,* respectively *a-integrity,* both separately and together, composed by a simple weighted average, whose weights are proportional to the importance of each of the items in determining the satisfaction of passengers with the services offered. They are differentiated according to the quality of the respondents (season ticket holder-not-holder), respecting the ratio between the frequency of journeys in the case of non-holders and holders. In this respect, I present two categories of

weights: total and individual. The first category, total weights, consists of total weights determined by the ratio of non-holder travel frequency to holder travel frequency.

c) Identification of the passenger profile

The passenger can be profiled in two key approaches: composite averaging, whereby I can identify an average passenger profile, and *k-means clustering* and *hierarchical clustering* analysis, to identify whether there are any aggregates of responses that indicate a situation where respondents are grouped into divergent subgroups. As a main objective, I will portray the average passenger. For secondary objectives, I aim to profile subjects by subscription and frequency of travel and should distinguish in the neighbourhood of four profiles (high or low level for frequency X holders/non-holders).

K-means clustering analysis serves to group items normally based on similarities in order to identify other characteristics of the items based on the resulting clustering. The main criterion in such clustering can be a dominant feature or a combination of dominant features that describe or differentiate the outline of possible clusters. In k-means clustering analysis. Clustering analysis is multidimensional and can track how several variables can be contoured into partitions.

5.5 Measuring the regularity, speed, rhythm and punctuality of public transport movements

In order to pursue this objective, we can refer to the answers given by the subjects in the questionnaire and their particular level of satisfaction, looking at the direct relationship between the item and its apparent dimensionality. If for regularity and punctuality, the items used are primary, for speed and punctuality they can at best estimate, on the basis of other data, the performance of the public transport system, in the sense that the data obtained on the basis of the questionnaire can at best model primary data obtained from other sources.

Certainly, the speed and rhythmicity of transport can be tracked as an indirect consequence of the regularity, punctuality and availability of public transport. More precisely, we can certainly track a generic phenomenon, that of movement between parameters delimited by the data provided by respondents, but we do not have a comparable certainty with monitoring traffic data at key moments in the annual circuit of elements that influence the variability of these parameters.

To assess the quality of public transport services, I present the items that directly assess the quality and combine them into a total public transport service quality score. The method is a weighted average of the main quality components, the aim being to assess the quality of public transport services through a summative indicator, alongside the direct presentation of all component dimensions and their values.

In the methodology of the questionnaire, we considered including an item (*q-e-ticketing*) to determine the degree of receptiveness of the subjects to technical innovation, aimed at making their lives easier, and an item to track how they consider themselves informed about the situation/availability of public transport (*q-info*). Their composition is simple and aims at determining an arithmetic mean, without weights or more advanced composition methodologies, which can however be the subject of future analysis or research, given that the primary items have been coded and that the values recorded for them can be kept and referenced in other research projects.

5.6. Descriptive statistics

Next, I present descriptive statistics for the sociodemographic data of the respondents. I am interested in the mean for each item, median, mode, standard error, standard deviation, variance, kurtosis and skew. For variables where these measures are not possible even with successive adjustments, I am interested in frequency analysis. Median and mode are necessary because the mean is often insufficient to characterize a data set.

Note that for the purpose of the comparative analysis of the data we transformed three dichotomous variables (inhabitant, gender, holder-non holder) into binary variables that can only take values 1 and 2. Thus, the mean value of 1.58 for gender does not reflect any tertiary gender category, but an average trend towards 2, due to the fact that there are 659 male respondents and 477 female respondents (the mean of the variable is a true ratio between the frequencies of the two possible values), and the holder-non holder score of 1.38 reflects the fact that there are more holders than non-holders. For the *resident* variable, the trend towards 1.05 of the mean reflects the fact that there are 1,076 residents and only 60 non-residents among the subjects and that residents were coded as 1 and non-residents as 2.

The selection of these two values is arbitrary, but I wanted to run other descriptive statistics in addition to frequency analysis. Consequently, for all three variables the measures of variance, kurtosis, standard deviation, standard error and skewness reflect precisely the dichotomous situation of the selected variables. The usefulness of this approach lies in the fact that it allows the comparative, numerical visualisation of all socio-demographic data.

In the table below we can follow the descriptive statistics for the collected sociodemographic data. I am particularly interested in the frequency of travel, the fact that the average level of education is quite high (to be expected given the age of the respondents), and I note that most respondents are holders, with a high enough level of professional development that some level of critical thinking and seriousness in the answers provided can be presumed.

Table 3. Descriptive statistics (socio-demographic). Source: own processing

	fv-travel	holder- non-holder	educational level	resident	gender	age	profession
Medium	2.39	1.38	4.02	1.05	1.58	2.14	3.63
Er. Std.	0.04	0.01	0.03	0.01	0.01	0.03	0.05
Median	2.00	1.00	4.00	1.00	2.00	2.00	3.00
Mod	2.00	1.00	4.00	1.00	2.00	1.00	3.00
Dev. Std.	1.33	0.49	1.01	0.22	*0.49*	1.03	1.73
Variance	1.76	0.24	1.03	0.05	*0.24*	1.06	2.98
Kurtosis	-0.61	-1.77	-0.06	14.06	*-1.90*	-1.07	-1.20
Asymmetry	0.73	0.49	-0.36	4.00	*-0.33*	0.37	0.21

In the same sense, the *profession* and *level of education* variables can be considered both descriptive and an indicator of the degree of independence and professional development (a higher degree of professional development is coded higher for self-employed or retired). In the case of travel purposes, the options offered are *work, school/college, school/childcare accompaniment, shopping,* and *others.* Numerical coding is not useful for these answers.

The reason the questionnaire follows a homogeneously distributed scale is to provide respondents with a simple way to estimate their travel frequency, without the complications of the various variants that would actually characterise travel frequency. Of those surveyed, 352

use the public transport system very frequently, followed by 361 who travel almost as frequently, totalling almost two-thirds of respondents.
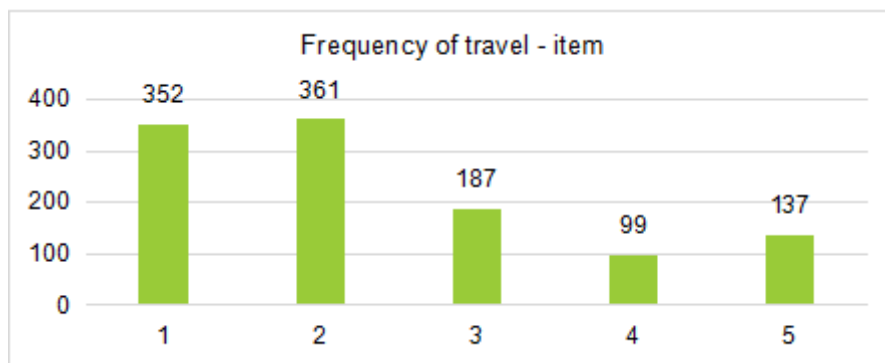

Figure 4. Item - Frequency of travel. Source: own processing

I analyse trip frequency as a response item, where a low value represents a high frequency, and then model the responses to characterize the true frequency as a guide because, as presented above, I prefer to assess trip frequency without adjusting for item reversal because the 10-5 scale used for reversed frequency is homogeneously distributed across intervals. But the frequency interpretation scale is divided into intervals about which I cannot presume any level of dispersion: we cannot know whether a travel frequency measured as an item of 2 represents a value of 5 or 6 weekly trips, nor whether respondents consider the item to refer to round-trip or one-way trips only.

Travel frequency analysis is important for profiling respondents because it allows profiling into subjects who travel infrequently and subjects who travel often. However, the responses are moderately skewed in favour of lower values (high actual frequency), which also explains the mean of 2.39. The season ticket holder or non-holder status is again a factor of interest in segmenting subjects for profiling purposes. Holders are more numerous than non-holders, but we cannot assume that holders would have a higher travel frequency than non-holders.
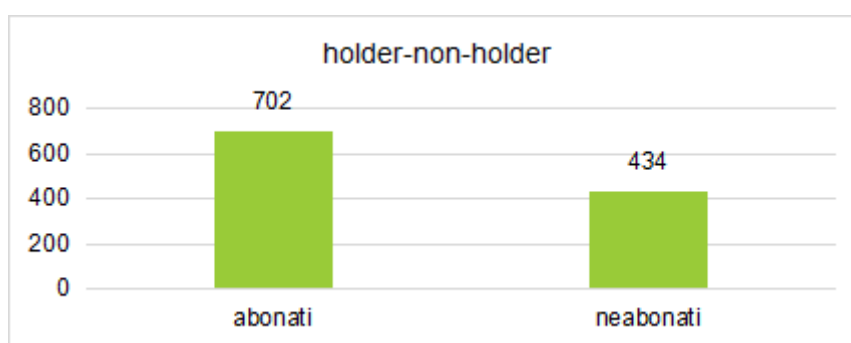

Figure 5. The number of season ticket holders and non-holders. Source: own processing

The main purpose of travel provides information on the nature of the occupation of public transport and the main categories of passengers in relation to the purpose of the travel. The quality of holder-non-holder also serves as a predictor or indicator in relation to the frequency and purpose of travel. The overall situation of the items expressing appreciation, both for the level of safety and for the regularity, punctuality, comfort and availability of public transport means is summarised in the form of descriptive statistics. In this way, we can follow

the similarities and differences between the items to be composed and how the control, *a-integral* item is different from them (including in terms of the interval scale, having a 10-point scale). More than three-quarters of respondents rate safety as satisfactory, but almost a quarter consider the safety level of the public transport system unsatisfactory, 128 are completely satisfied and only 34 consider safety completely unsatisfactory.

The majority of respondents feel safe using public transport, which is consistent with how they rate other components of comfort and safety, which can also be seen in the correlation matrix in the section on comfort and safety. Analysing the results obtained, we note that the proposed method of estimating the weights of the primary items in the composite item *satisfaction* cannot include the surprising situation of the studied sample: subjects without a season ticket, although less numerous, have a higher frequency of travel.
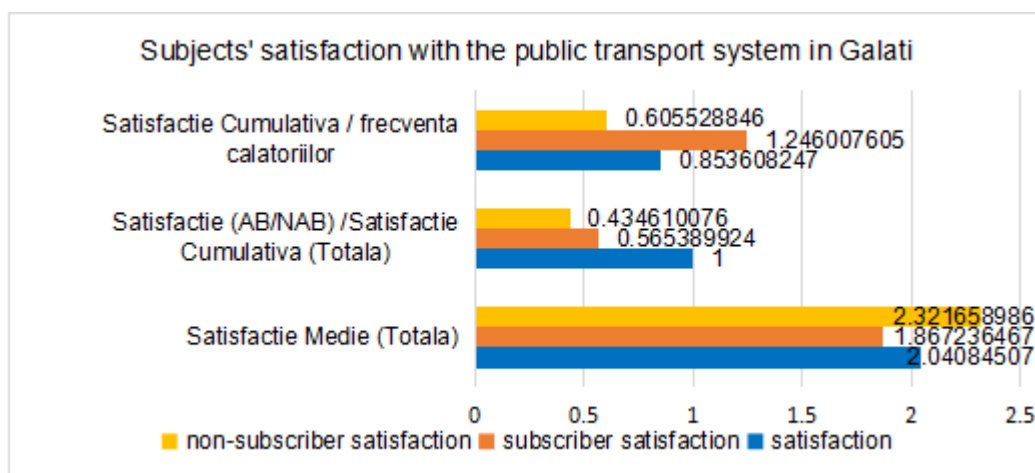

Figure 6. Subjects' satisfaction with the public transport system in Galati. Source: own processing

Overall satisfaction (for holders and non-holders) ranges from a high of 3.8 out of 5 (exceptional values) to a low of 1.4, with an average of 2.04 and a distribution substantially centred around the middle. We note that holder satisfaction (mean) is below average and that the difference is comparable to how non-holder satisfaction differs from the mean.

5.7. Exploring the internal relationships of the questionnaire

We observe weak positive or negative correlations between the sociodemographic data and the rest of the variables, except for the *profession* item, which shows a strong and positive correlation with the *age* item. At the same time, we also observe a strong and positive relationship between travel frequency and appreciation for the e-ticketing system, with an r = 0.89, which makes sense given that the main beneficiaries of an e-ticketing system are frequent passengers.

Similarly, we observe that there are very strong and positive correlations between ticket collector quality and a number of other variables, including frequency of travel and perception of comfort with r=0.91. We observe that there is a very strong and negative relationship between the e-ticketing system and those who rate availability. In the absence of data on the socio-demographic situation of the subjects, the correlation matrix aims to present relationships between variables for which there are genuine connections worth exploring. Some of these results were used to guide efforts to compose primary items into indicators that measure or identify various aspects related to the research objectives.

5.8. Conclusions

We conducted this research in order to measure the degree of satisfaction and safety, identify the passenger profile, evaluate the degree of comfort, and the degree of regularity, speed, rhythm and punctuality of the circulation of public transport in Galati. Also, by carrying out the research, we wanted an overview of the quality of public transport services and the results of the application of improved passenger traffic management. The questionnaire was used as the instrument for collecting responses.

In the category of sociodemographic items, we included the quality of the subjects (season ticket holders or non-holders) because it is specific to the objectives of the present research, with a significant impact on the analysis of the answers provided. We started from the idea that through the quality of the subjects, especially holders, we can identify the level of satisfaction with the services offered and the appreciation for the comfort level. We established the essential sociodemographic benchmarks for identifying the passenger profile, namely: level of education, purpose of travel, quality of resident of the municipality of Galati, gender, age, and profession, especially for the subjects with the quality of holder (i.e., when the subject holds a travel pass).

We also measured passenger satisfaction and safety with the urban transport system by assessing the following aspects: regularity of buses, punctuality of buses, comfort of travel, and the overall travel experience. We found that the availability of public transport can have an indirect impact on the perceived comfort of the passenger, as low availability can affect the comfort of the passenger by having to wait for longer periods of time.

In order to measure the regularity, speed, rhythm and punctuality of public transport, I referred to the answers given by the subjects in the questionnaire and at their level I have customised the degree of satisfaction, following the direct relationship between the item and its apparent dimensionality. The items regularity and punctuality were used to evaluate the performance of the public transport system, and the speed and rhythm of transport can be traced as an indirect consequence of the regularity, punctuality and availability of public transport means, more precisely, to trace the generic phenomenon, that of the circulation between the parameters delimited by the data provided by the respondents.

For the assessment of the quality of urban public transport services, we have made a weighted average of the main quality components, the aim being to assess the quality of public transport services through a summative indicator, alongside the direct presentation of all component dimensions and their values. A certain level of quality can also be identified as a consequence of the total level of appreciation shown. In addition, season ticket holder or non-holder status is also a factor of interest in segmenting subjects for profiling purposes. Holders are more numerous than non-holders, but I cannot assume that holders would have a higher frequency of trips than non-holders.

The majority of respondents consider that urban public transport in Galati is qualitative, that they are safe using urban public transport, taking into account how they evaluate other components of comfort and safety. Respondents also rated the aspects surveyed: regularity, speed, rhythm and punctuality of the movement of means of transport as being in line with their expectations.

The degrees of regularity, speed, rhythm and punctuality of public transport in Galati, as well as the level of satisfaction, safety and comfort of the journey perceived by passengers, have achieved favourable results, which indicates the successful adoption of new strategies for urban public transport in the future. Moreover, a managerial programme can be designed to

implement a sustainable public transport system, noting from the results obtained the openness of the population towards the use of the services offered by TRANSURB S.A. Galați.

FINAL CONCLUSIONS. PERSONAL CONTRIBUTIONS. DISSEMINATION OF RESULTS. FUTURE RESEARCH DIRECTIONS

This PhD thesis presents both a theoretical and an applied framework based on previous studies by other researchers in the field that refer to the promotion and adoption of a sustainable urban public transport system. The literature review has highlighted the growing interest of specialists in the development of sustainable transport systems. We note recent concerns in the formation of sustainability-oriented policies that address the negative effects of pollution, congestion reduction and social exclusion. Through the development of a relevant management plan, sustainable development in the transport sector can be implemented to meet the current and future mobility and accessibility needs of citizens.

The value of the studies presented in this PhD thesis is that the information obtained can be used both by managers in their planning work and by the competent authorities in identifying and understanding all the stages and mechanisms that determine efficiency in the urban public transport sector. With this PhD thesis, I aim to open the horizons for new research that can be developed for future scientific articles.

The first chapter contains general considerations on management applied in the transport sector. Topics presented in this chapter include management functions applied in the transport sector, advanced management systems, innovation strategies in transport, general issues in urban public transport, policy and strategic tools, advanced passenger information systems, urban public transport policies, and a review of the literature on applied management in the urban public transport sector using VOSviewer software.

The second chapter presents the current state of research in the field of urban public transport in Romania. Among the topics covered are the urban public transport system, a SWOT analysis applied to transport in Romania, key objectives of EU policy for the transport sector and management strategies for transport infrastructure development in Romania. Chapter three presents urban transport – its legal framework and conceptual delimitations. Among the topics presented are the sustainable development strategy, objectives for developing the sustainable transport development strategy and policies and measures for implementing the sustainable transport development strategy.

In chapter four we have presented the urban transport strategy in the municipality of Galati. The topics of interest are the purpose of the sustainable urban transport strategy, directions of action to implement the transport strategy and the investment plan supporting the strategy. The fifth chapter contains the study on passenger satisfaction with the TRANSURB S.A. GALATI transport service. The topics addressed are sampling and representativeness, operationalisation of the questionnaire applied and coding of questionnaire items, operationalisation of questionnaire items, measurement of the degree of regularity, rapidity, rhythmicity and punctuality of public transport circulation, descriptive statistics and exploration of internal relationships of the questionnaire.

The personal contributions consist in the fact that the information obtained from the questionnaire, analysed by means of SPSS software, can be used to design programmes to attract the citizens of Galati to use urban public transport more, identify the aspects that need to

be improved in the urban public transport system in Galati and, last but not least, form an overall picture of the urban public transport services.

The results obtained from this research contribute both at the theoretical level, as they advance previously studied research topics, and at the practical level, as they offer some solutions that can be used in urban public transport management. Through this PhD research, I aimed not only to obtain general information in the field of management applied to the transport sector but also to highlight the need to apply management strategies that aim at sustainable development, explain the negative effects of transport on the environment, and last but not least, identify the profile of passengers in Galati.

The limitation of this research lies in the impossibility of presenting valid conclusions on the profile of the passenger from Galati because the questionnaire was conducted on the spot, directly on the bus. Thus, we have not analysed the answers of all the people from Galati who travel by bus in general, recording only the answers of those who travelled by public transport during the survey period. In addition, some responses could be influenced by certain subjective factors (the passenger's mood at the time, willingness to respond, attitude, etc.). Also, conclusions cannot be presented for the whole country because I chose to analyse only the opinion of passengers from Galati. Thus, the sample is representative only for the South-East region of Romania.

In the future, for the accuracy and relevance of the results on the image of urban public transport, I propose to carry out a nationwide study on the opinion of passengers, then profile the passengers and identify the necessary strategies that should be applied for the development of sustainable urban public transport. The in-depth research is justified by analysing issues such as the importance of promoting a cleaner environment, sustainable development, raising awareness of the population to contribute to environmental sustainability and increasing the willingness to use urban public transport.

The summary of the research directions is as follows: extension of the study to the national level on the profile of the passenger using the bus to travel in urban areas and the formation of an overall picture of passenger perceptions of urban public transport, information that can be used to adapt management processes to improve the transport sector.

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LIST OF PUBLICATIONS

1. Published papers

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5. Pripoaie, R., Susanu, I. O., & **Cadinoiu, M.** (2020). International VAT Rate cuts to Support Entrepreneurship within Coronavirus Pandemic Context. *Revista de Management Comparat International*, *21*(5), 730-738.
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2. Participating and presenting papers at national/ intrernational conferences in the field

1. **Cadinoiu** M. (2021). Approaching the concept of performance in urban public transportation - INTERNATIONAL DOCTORAL SCIENTIFIC SYMPOSIUM "MODERN TENDENCIES OF SCIENTIFIC DEVELOPMENT: VISIONS OF YOUNG SCIENTISTS" - MTSD 2021, conference programme available at: https://ince.md/uploads/files/1641905253_international-doctoral-scientific-symposium-_t-final-.docx.pdf