



STRATEGIES FOR QUALITY MANAGEMENT OF SERVICES IN RAILWAY TRANSPORT

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Abstract: *The systems approach is used to analyze transport, considering it as a vast and complex system. This approach allows using the achievements of modern science. Increasing the efficiency of management and the overall functioning of transport systems in modern conditions requires in-depth theoretical and practical knowledge. At this point, one of the main goals is a comprehensive understanding of the problematic situation in large economic systems. In the modern economy, terms such as "total quality" or "organizational excellence" are increasingly common. This global trend has also been observed in Bulgaria in recent years, with organizations structuring and managing themselves to meet the challenges of the modern market, complying with the concept of quality.*

Key words: *risk, quality of services, railway transport, safety, management.*

1. INTRODUCTION

Rail transport plays a key role in Bulgaria's economy, providing mobility for passengers and freight in different parts of the country. With increasing liberalization and competition in the sector, the need for high quality services is becoming more and more obvious. Given the unique climatic, political and economic conditions of our country, the rail system bears most of the transport burden due to its wide coverage. As the market economy continues to strengthen and a competitive environment emerges in the rail sector, the importance of providing high-quality transport services is becoming increasingly relevant. Therefore, the expectations and demand of transport users are increasing. In light of these circumstances, the growth and progress of the rail system should be focused on meeting the modern needs and expectations of a large customer base.

Ensuring customer satisfaction and adhering to safety and environmental standards are the main goals of quality management in rail transport. This includes a comprehensive analysis and implementation of measures to meet the expectations of both customers and local consumers. A transport service quality management system is a set of strategies, techniques and resources designed to establish and maintain a high standard of service following internationally recognized principles. These principles, which guide the organization, both at the managerial and operational level, are fundamental in assessing the competitiveness of services in the market.

In a competitive environment, it is crucial for all individuals employed in the rail transport industry to understand the importance of user requirements and develop adaptable technologies that can quickly respond to emerging demands. Through the analysis of the interaction process, railway undertakings can identify several opportunities to gain a competitive advantage in the services they offer. These capabilities include the ability to establish a secure market position through a distinctive sales project that sets them apart from competing companies over an extended period of time. Additionally, focusing on the specific needs of customers allows these businesses to cater to the target consumer group and reap the benefits of doing so for themselves. Finally, surpassing competitors' products in terms of key quality parameters ensures a superior level of product quality.

The views of consumers and providers regarding the creation of a quality service undoubtedly differ. Consumers prioritize the principle of "high quality – low price", while suppliers strive to maximize their benefits and gain a competitive advantage. The focus of the current quality system is on satisfying the requirements of users, which ultimately determines the level of efficiency in quality management. That is why it is imperative to thoroughly study the state of the existing quality management system in Bulgarian railway transport.

2. REASONS THAT HAVE AN IMPACT ON THE PROGRESS OF RAIL TRANSPORT.

The development of railway transport and investment policy in railway infrastructure are influenced by several main factors:

- The phenomenon of globalization, along with fluctuations in oil and energy prices.
- The progress of trade, industry, energy, agriculture and tourism.
- Ecology, geographical location, population mobility, demographic change and social processes.

The opening of national economies and the subsequent development of economic relations revolve around globalization, which serves as the basis of economic life. This global trend necessitates the continuous exploration of new methods of competition and covert protectionism in order to protect the economies of smaller nations from the encroachment of larger ones, while positioning themselves as worthy partners. Failure to strike this balance and over-reliance on protectionist measures can lead to isolation. Therefore, it is imperative that the Bulgarian economy and the transport sector proactively prepare for this ongoing global economic trend.

The growth of various sectors, including trade, industry, energy, agriculture and tourism, has an indirect impact on the development of rail transport and subsequently affects planned investments in this sector. The expansion of production in these industries leads to an increase in demand for transport services, with some of these services, especially in industry and energy, being directed to rail transport. In cases where there is an increase in traffic in certain directions and a lack of capacity, there is a need for investments to improve and expand the railway infrastructure, which directly affects the investment policy. Thanks to our favorable geographical position, a significant transport corridor passes through our territory. This corridor has been identified by the EU as a priority for investment in both rail and road infrastructure. In order to align with the objectives set out in the White Paper, environmental considerations are at the heart of both transport and investment policy.

Europe is focusing on investing in energy-efficient and environmentally friendly modes of transport, such as rail. The investment policy is aimed at modernizing key railway routes that have high levels of activity and are of strategic importance. The transport system in the Republic of Bulgaria is determined by both the size and the movement of the population. The distribution of the population can affect the development of new railways and the improvement of existing ones. These factors, together with demographic and social changes, have an indirect impact on the railway infrastructure investment strategy.

Our geographical location gives us the advantage of being a key transportation hub. Taking this into account, the European Union is prioritising investment in the railway and road infrastructure that passes through our territory. In line with the objectives set out in the White Paper, our transport and investment policies place a significant emphasis on environmental considerations. Europe specifically encourages investment in energy-efficient and environmentally friendly modes of transport, such as rail. Therefore, our investment policy is focused on the modernization of highly loaded and strategically important railways. The size of the population and its mobility patterns play a decisive role in shaping the transport framework of the Republic of Bulgaria. The distribution of the population can have an impact on the construction of new railways and the modernisation of existing ones. These factors, together with demographic and social dynamics, indirectly affect our investment policy in railway infrastructure.

Compared to other modes of transport, rail represents only 10% of the total transport volume. However, it offers numerous environmental benefits compared to other ground transportation options. The use of electric traction in rail transport makes it significantly more energy-efficient than road transport and minimizes damage to the environment. In fact, the energy consumption of transporting one passenger by rail is approximately 3.5 times less than that of a car, while transporting one ton of

cargo requires 8 times less energy. In addition, the ratio of greenhouse gas emissions between road and rail transport is 20:1 (Minkov, 2011, pp. 82-91).

The current state of the quality management system reveals a decline in the volume of transports, accompanied by a deterioration in the user experience and an increase in customer dissatisfaction with the services provided by the Bulgarian railways.

According to data from the National Statistical Institute (NSI), the number of passengers transported by rail in Bulgaria ranged between 17 and 23 million people in the period 2021-2022. passengers, which is an increase from 17.15 million. At the same time, the transport work performed has decreased – from 1.60 billion. passenger-kilometers (2021) to 1.21 billion. (2022), which means that the trips were shorter.

Table 1: Annual number of passengers and passenger-kilometres

Year	Passengers transported (millions)	Passenger-kilometres (billion)
2021	17,15	1,60
2022	23,04	1,21

Rail freight transport also recorded a slight decline - from 7.14 million. tonnes in 2021 to 7.02 mln. Accordingly, the freight work performed decreased from 2.14 to 2.12 billion tons. ton-kilometers.

Table 2: Goods transported and work performed

Year	Transported cargo (million tonnes)	Ton-kilometers (billion)
2021	7,14	2,14
2022	7,02	2,12

It is possible to give the argument (Dimitrov, <https://mtc-aj.com/library/139.pdf>.) that the implementation of quality management in transport services is carried out through monitoring and application of specific indicators, with the main focus on:

- Transport safety includes a wide range of organisational and technical measures that are designed to minimise risks to the life and well-being of passengers, ensure the security of the goods transported and maintain the safety of infrastructure facilities.
- The timely transportation of passengers and delivery of goods shall be ensured by observing the announced schedule, contractual obligations or other established requirements regarding the movement of vehicles.
- Ensuring the safety and integrity of luggage and cargo during transit is of utmost importance, with a focus on preventing loss, damage and contamination.
- The service provided includes a meticulous combination of quality assurance and time spent preparing transport documents, selling tickets, and operating terminals.
- The trip itself offers a range of comfort and amenities, including fast travel, climate control, catering, and excellent service.
- The provision of communication services, including information services, is one of the main indicators of the current quality of transport services.

The length of the service cycle is the key factor in determining the quality of service provided to users of the service. This cycle is measured from start to finish of transportation and plays a vital role in the overall experience. In today's modern world, transportation is a crucial economic activity that is closely linked to the movement of people and the development of the economy. It serves as a vital link, connecting different regions in a country and facilitating the transportation of different types of cargo and passengers both domestically and internationally.

The railway industry is not concerned with the extraction, processing and production of raw materials or the creation of new products. Instead, transport plays a crucial role in facilitating connections between individual producers, producers and consumers of material goods, and people in general. Multiple factors have an impact on the growth and development of rail transport. As a service-oriented sector, its development is directly influenced by economic, socio-demographic,

political and environmental factors, each with its own range of influence. These factors interact with each other and usually have a multifaceted impact on the industry.

The demographic situation in the country is in addition to the socio-economic factors that affect the location of production capacities, personnel, urban centers and the development of the settlement network, as well as foreign trade relations. Over the past few years, there has been a decline in the travel of citizens, which leads to interruption or significant reduction of transport links between different settlements. As a result of the significant decrease in passengers, it has led to the closure of separation points, stops and small stations.

Rail policy plays an important role in shaping the transport landscape. The European Union, through Directive (EU) 2016/798, obliges the Member States to ensure the safety of railway transport and to work for its continuous improvement. In line with evolving legislation and advances in science and technology, the European Railway Agency (ERA) has been established to develop technical specifications for interoperability (TSI) and promote standardised safety measures in rail transport. These efforts are crucial to foster the growth and progress of both passenger and freight transport. To achieve these objectives, the application of common safety methods (CSMs) has been developed, which effectively improve common safety standards and ensure the sustainability of rail operations.

The Railway Transport Act outlines the requirements at national level governing the construction, maintenance, development and operation of railway infrastructure, safety and interoperability standards, as well as the dynamics between carriers and customers in the provision of railway transport services.

3. CHARACTERISTICS OF RISK IN RAIL TRANSPORT.

Risk management plays a vital role in the management of transport systems, especially in the context of railways. This includes assessing the likelihood and severity of potential harm. Risks can be categorized as individual, affecting only one person, or public, which refers to the average risk of deaths on the tracks. The rail system, as a complex adaptive system operating in a dynamic environment, requires specific considerations when it comes to risk management.

In order to ensure the implementation of risk control measures, it is crucial for all railway undertakings, infrastructure managers and maintenance entities to ensure that their contractors and other parties comply with them (Nikolov, https://mech-ing.com/journal/Archive/2010/8-9/18_23.nikolov.tm.10.pdf). The monitoring methods specified in the common safety methods should be applied by each railway undertaking, infrastructure manager and maintenance authority. These measures must be included in the contractual agreements with their contractors. Agreements play a vital role in the safety management system of railway undertakings and infrastructure managers and must therefore be made publicly available upon request by the European Union Agency for Railways ('the Agency') or the national safety authority during the supervision of activities, as established by Regulation (EU) 2016/796 of the European Parliament and of the Council.

In order to facilitate the recognition of results and maintain safety standards in the rail system, it is imperative to reach consensus on the risk assessment procedure. The risk assessment process includes several successive stages:

1. During this phase of project development, specific criteria for the assessment process covering the design standards for the relevant infrastructure in accordance with the CSMs shall be established and improved.
2. At this stage, the risk assessment includes taking into account both the rich previous experience in the relevant field and the latest research carried out in this specific direction.
3. The creation of a train accident model is based on a statistical assessment of past accidents and incidents, which includes carrying out a risk assessment.
4. At the safety review stage, the design is subjected to a thorough study while it is still in the design phase, which allows the necessary adjustments to be made immediately.
5. During the implementation phase of the project, a key focus is placed on raising safety criteria.

It is important to mention that the development will focus solely on the concept of "pure risk", which is associated exclusively with negative results, as opposed to speculative risk, where both losses and gains are possible. When discussing "pure risk", we can categorize it based on the terms and conditions and its origin, and the following objectives are addressed in order to achieve the desired result:

- Study of the fundamental nature and characteristics of complex systems, including their different properties and different classifications.
- Comprehensive review and evaluation of modern methodologies and approaches used in risk assessment and analysis.
- Consideration of the creation and development of the railway system in the Republic of Bulgaria.
- The study of the structure of the railway system of our nation and the dynamics in it.
- The study of safety trends and general safety indicators in railway transport in Bulgaria is the focus of this study.

This article provides a comprehensive overview of the strategies, regulatory obligations and initiatives aimed at improving safety in the railway transport system in Bulgaria. The task includes research and evaluation of international practices related to risk management in rail systems. Our country is actively working on the development of comprehensive guidelines aimed at improving risk management in the fundamental aspects of the railway system.

The rail carrier company has successfully developed and received approval for its risk management methodology. The creation of a safety report for the rolling stock placement process is an essential aspect of its development. Risk arising from persons, organizations or public processes is usually referred to as organizational-societal risk. The inherent risks posed by natural conditions and their fluctuations contribute to both the environmental and energy vulnerabilities of rail transport.

Railway safety depends to a large extent on the effectiveness of train control and signalling systems. To improve safety levels, the European Rail Traffic Management System (ERTMS) has been implemented on the rail network, making a significant contribution to this endeavour.

4. CONCLUSION

The managing bodies of infrastructure and railway undertakings have the obligation to establish a safety management system that adheres to the standards set by the European Union and includes shared components. The requirements for monitoring and evaluating the quality of services are determined by the need for rail transport to effectively protect the public interest. In addition, the use of specific models generates frameworks to improve and streamline services within the rail system.

The positive interaction is generated through the interconnection conditions in a rail environment. The models cover both qualitative and quantitative variables that relate to the level of quality of transport services. To achieve favorable results, it is crucial to understand the process and at the same time improve it through the use of various quality management tools.

By using knowledge of the human factor and recognized methods, the safety management system must effectively correspond to human abilities, limitations and various factors that affect human actions. This includes optimizing processes and continuously increasing staff expertise, which in turn allows for better adaptation to global changes.

To succeed in the transportation industry, it is crucial to improve understanding customer needs, use both subjective and objective data, and use statistical analysis within these operations.

REFERENCES:

1. Minkov, T., Ecological Characteristics of Transport in Bulgaria, Proceedings of Scientific Reports "Transport in the Global Economy", IC-UNWE, 2011, p. 82-91.
2. Nikolov, V., "Factors Influencing Safety in Railway Transport", State Enterprise "National Railway Infrastructure Company", Sofia, Bulgaria, https://mech-ing.com/journal/Archive/2010/8-9/18_23.nikolov.tm.10.pdf.
3. Dimitrov, D., Hadzhiev, E., Tsankov, G., "Safety and Health at Work in Transport – Trends and Guidelines for the Development of Vocational Training", ISSN 1312-3823, <https://mtc-aj.com/library/139.pdf>.
4. National Statistical Institute (NSI) <https://www.nsi.bg/>
5. European Commission. Transport // https://ec.europa.eu/info/topics/transport_bg.
6. Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety // <https://eur-lex.europa.eu/legalcontent/BG/TXT/PDF/?uri=CELEX:32016L0798&qid=1624020283879&from=BG>.
7. Railway Transport Act (promulgated SG No. 97 of 28.11.2000).