MANAGEMENT STRUCTURES IN THE RAILWAY INDUSTRY

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Abstract: *This paper presents an overview of the organizational management structures in the railway industry, as well as detailed information on how to apply the different organizational models. The essential target for the long-term expansion of the railway industry, applying the relevant European legislation, is to ensure that the system is reformed so that the competitiveness of the European market for the services provided increases. To achieve this goal, it is essential to understand and carefully analyze the existing railway management models. In conclusion, the paper analyzes and evaluates organizational models to establish the advantages and disadvantages of choosing an optimal structure. Although the subject is much broader, the purpose of this short analysis is to open new horizons and directions of research.*

Keywords: *railway management, management structures, railway transport*
JEL Classification: *L92, O10, R40*

1. Introduction

The new challenges and the decline of the railway sector have led to a worldwide restructuring movement, with the main objectives of these reforms being to improve the quality of services and reduce costs.

Most states have generally chosen to keep transport infrastructure under the management of a public entity, creating infrastructure managers to regulate private transport operators and setting up legally independent but state-owned companies to manage infrastructure and operate passenger transport services or merchandise.

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In terms of competition, the reforms have been different around the world and, where introduced, have been done by directly facilitating the free entry of new companies into the rail network or by promoting market competition through a franchising system or concessions in which companies compete for the right to use and/or operate the infrastructure for a certain period of time.

Because of these changes, railways now come in all shapes and sizes: vertically integrated, vertically separated, with or without competition, public and private, passenger or freight, dominated or mixed, subsidized or fully self-financed. This paper presents these models and their variations, as well as their costs and benefits with reference to studies in the literature.

Europe's railway sector has been reshaped on two levels: the vertical structure, which drives the relationship between infrastructure and transport services, and the horizontal structure, which manages the relationship between service operators using infrastructure. In other words, reorganization measures can be divided according to the degree of vertical separation introduced after the change and the degree of competition allowed after the reform.

With regard to the first dimension, there are three main options for the vertical organization of the railway industry: vertical integration, competitive access for operators and vertical separation.

The first option corresponds to the traditional model of organizing railways, where a single company (usually public) controls the entire infrastructure, as well as operational and administrative responsibilities (Cantos, et al., 2012). The definition of restructuring of national railway companies and modes of transport infrastructure management in Europe is mainly based on expert opinions and depends on defined traffic policies, the development of the country, and the willingness to accept change (political, social, and other).

The analytical development of the railway sector in the new circumstances of the transport market, the liberalization of the railways

and the privatization of the railways as service providers are presented in the paper.

A country's rail transport system consists of the sum of the related subsystems which, in terms of competition and complementarity, share the same market ensuring that passenger or freight transport requests are met.

The main objective is to understand the different management structures and the opening of new future research horizons.

2. Description of the organizational structures of railway management

Network industries, such as railways, have usually been vertically integrated due to savings in order to minimize transaction costs and economies of scale with a single operator. However, this model has been challenged since the late 1980s, on the grounds that the benefits may offset several higher costs. Since then, many states have disaggregated their usual structures. In some industries there has been a consensus on the best way to reform:

- in the energy sector, the transport network must be separated vertically;
- the telecommunications industry should remain vertically integrated with the competition offered by operators who have open access to installations owned by another operator (Drew, 2006).

But in the railway industry, there are several models of structures that could be adapted to the needs of each state, without an optimal structure. Below we will present some successful models that have been implemented in some European countries and with which remarkable performances have been obtained.

In recent years, however, attention has shifted to the effects on the performance and productivity of vertical industry disaggregation, ie the separation of ownership and maintenance of the railway and associated

infrastructure (signal equipment, stations, etc.) on the one hand and the movement of trains on the other. In several network industries, vertical unbundling has stimulated the development of competition and the achievement of larger and more efficient markets, stimulating the creation of additional jobs and increased investment.

The railway sector differs from other service networks in particular as regards systems requiring coordinated investment and the considerable technological barriers that exist between Member States.

Following specialized studies, it was considered the separation of network industries, comparing the benefits of introducing competition with the costs of increasing coordination. We believe that the benefits of separation should increase according to two factors:

- the share of industry costs in activities where competition is sustainable;
- the potential for improved productivity.

The share of industry costs in potentially competitive activities is high in the rail freight industry (60-80%), but only moderate (50-60%) in the rail passenger industry. The potential for improving productivity is considered to be relatively low on the railways due to limited possibilities for technological change.

It is also considered that in relation to the energy and telecommunications industries the separation costs are high for rail passenger transport (due to the large share of infrastructure in the total cost and product heterogeneity, both increase transaction costs), but moderate for rail freight (Gómez-Ibáñez, 2003).

By studying the vertical structure of the railways, it is possible to assess the cross-elasticity between infrastructure production and different service operations by introducing a logarithmic cost function into a data set (Ivaldi & McCullough, 2001).

Further studies show that the cost function between infrastructure and transportation operations of railways in the United States shows that organizations running each activity separately would have up to 24%

higher operating costs than a vertically integrated company (Ivaldi & McCullough, 2008).

Another study of Japanese railways shows that a vertically separated structure has up to 5.6% higher costs than an integrated system.

The basis of this model (vertical separation model) is the complete division of the infrastructure company and transport operators, ie the organization of independent companies (infrastructure, passenger or freight company), managed separately by unrelated managers (e.g. Sweden, UK).

A similar variant of this organization is the structure in which the railway transport services are also completely separated from the management of the railway infrastructure, but the infrastructure is divided between several independent companies, which ensure, e.g. access planning, maintenance and collecting tariffs (e.g. the Netherlands) (Mizutani & Shoji, 2001).

In conclusion, we can say that it is much easier to compare the productivity and performance of an integrated holding company than of several totally separate companies.

A study of data taken from Europe, on different structure models and using a logarithmic function, showed as in a structure with a competitive market, where more actors are involved and the efficiency is higher, but in the vertical separation structure it is low, which confirms that the integrated holding structure is more advantageous (Rivera-Trujillo, 2004).

The integrated model (holding structure) can be implemented on the basis of a vertically integrated model, ie a central administrative structure, where the railway infrastructure is managed by a separate and independent legal entity but which together with the other companies (passenger transport, freight, etc.) belong to a group (e.g. Germany, Italy, Austria, France, Poland).

Although they belong to the same group, the infrastructure manager does not have the right to offer the group companies an advantage over

other private operators (companies) that provide railway transport services and do not belong to the holding company (Nikitinas & Dailydka, 2015).

The architecture of a holding company is characteristic of an association of a system (ie the coordination of several actions for a common outcome with economy of means in a unified system, a synergy).

Resources and staff are used efficiently, with a single investment policy. All decisions, research and investments are concentrated in a single subject of activity (holding), the final price of any investment project being reduced (Nikitinas & Dailydka, 2015).

The profit of the holding is closely related to all the factors of the system that carry out simultaneous activities. The main entity of the holding company organizes and plans the financial directions and policies in favor of all the actors belonging to the holding company.

This avoids duplication of functions and specialists, employees, working in the main holding company, serve not one but all group companies, therefore, their potential is used to the maximum, and salaries are fully justified and yield increased (Nikitinas & Dailydka, 2015).

The advantages of a holding structure are:

- good coordination between the infrastructure manager and the transport operators, the interoperability of the system, the ability to work together to achieve a common goal, the cooperation between the different companies of the group;
- efficiency of decisions regarding risk regulation, security and traffic safety;
- there is no discrimination between the infrastructure manager and the transport operators, the infrastructure manager is interested in the maintenance of the infrastructure and its development, therefore he invests in it more constantly.

Following the approach of the "Deutsche Bahn" model, it can be seen how the continuity of integration allows to reduce the coordination costs

incurred in implementing the holding model, institutionally integrated but divided into several layers, as well as opening the railway to owned organizations, major carriers on the German market. They are "strangers", resulting in an effective interaction with them.

Vertically integrated rail systems provide an excellent opportunity to optimize the "whole system" by ensuring that each element and each component is combined into subsystems that work together and optimize the whole (International Railway Journal, 2002).

A vertically integrated holding structure can ensure the necessary independence if solid "Chinese walls" are built, guaranteeing legal, financial and operational separation, for example: completely separate decision-making bodies, to avoid discriminatory practices, flows separate financial statements (with separation of accounts and guarantees that railway companies do not receive cross-financing from the infrastructure manager's revenues), separate IT systems, to eliminate the possibility of conflicts of loyalty.

Infrastructure managers must have operational control and financial independence from any transport service operator operating trains. This is essential to eliminate possible conflicts of interest and ensure that all companies have non-discriminatory access to the railway lines.

If the infrastructure manager is not completely separated from the rest, national monopolies will continue to exist in many markets, which will prevent the improvement of services generated by competitive pressure (Comisia Europeană, 2013).

Therefore, the holding model complies with European Union regulations in this regard and is commonly used in many countries. Although there are specific differences, the following states have an organizational structure similar to the structure of a holding company: Austria, Germany, Italy, Poland, etc. (Wolff, 2011).

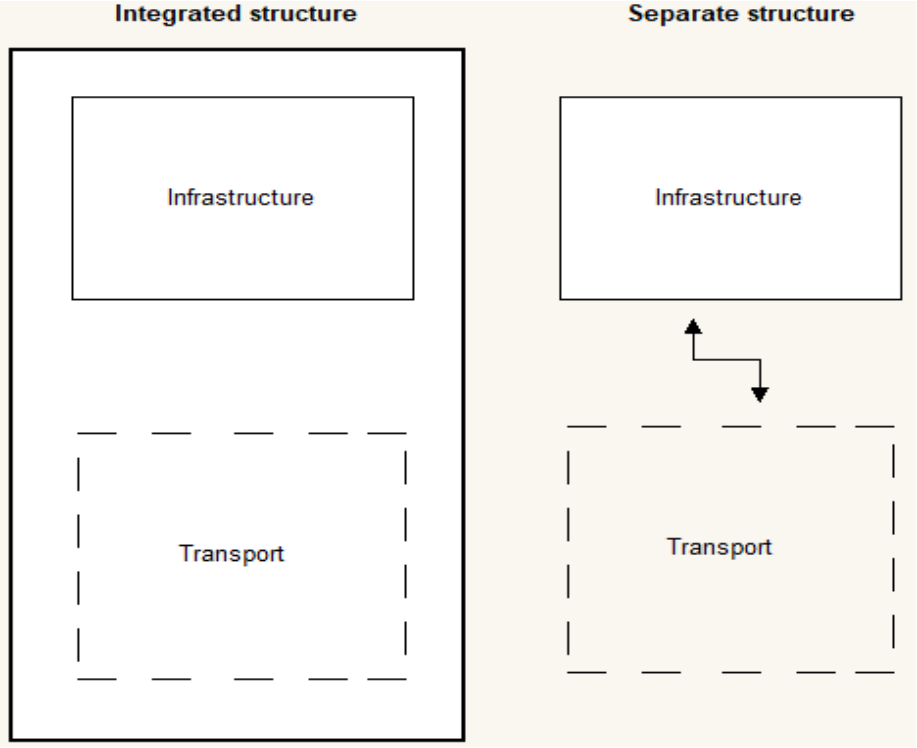

Figure 1. Examples of structures.

The vertical separation model is also quite common in Europe in different configurations, in Romania being implemented the "pure" form of the separation model (complete separation of companies, without being part of a common group), another example of total separation is the UK.

3. SWOT analysis of different organizational models

The assessment of the advantages and disadvantages of each organizational model is qualitative and performed through SWOT analysis (strengths, weaknesses, opportunities, and threats). This SWOT analysis is intended to provide sufficient information to facilitate a

decision-making balance regarding whether or not to implement a management model.

"*How can the organizational structure of a state's railway sector be improved by increasing overall performance, depending on its specific environment and context, taking into account studies on different models and performance from their implementation in other European countries*?". This question requires a thorough study of the impact of different forms applied to the railway sectors in different states and a thorough research in the literature. To determine the best method for choosing an organizational model suitable for a railway system is the study and research of similar states that have a high-performance system, a similar railway network and a similar size. Comparing the performance of rail systems in Europe stimulates the identification and application of the most efficient structure in a given railway sector.

The railway sector is a "hot topic" nowadays, not only in European countries, but worldwide. Bringing the railway system back to the forefront and tilting the modal choice in favor of the railways is one of the main targets in recent years internationally. The European railway system is once again in the spotlight and national and international interest is growing in achieving a unique and high-performance network. After many years of stagnation, new railway lines, high-speed corridors are being built, the current infrastructure is being modernized and investments in new high-performance trains have begun to take place in most states, which means an increased interest in this ecological way. Being seen as an environmentally friendly mode of transport is considered a good alternative to other competing modes, the railways are starting to flourish again, especially in densely urbanized areas, so it is necessary to choose the best management in this industry.

A multitude of management models are now to be found in the various railway sectors around the world, carefully adapted to a country's national orientation *"how a railway should be managed"*.

The following figure shows a standardized framework structure that allows the identification and comparison of organizational models in different states. In this context, all entities involved in the national

railway sector can be placed in one of the exposed compartments, according to their specific role.

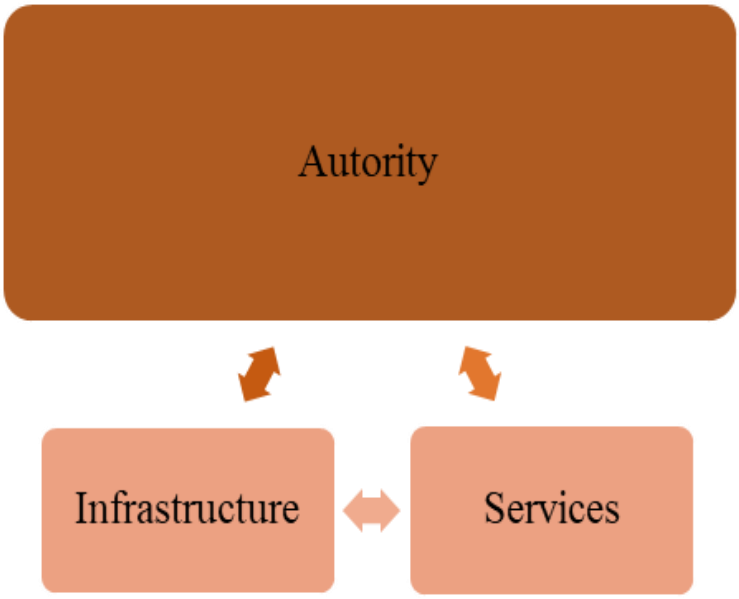

Figure 2. The standard framework for identifying an organizational structure.
Source: (van de Velde, et al., 2008).

This standard form allows the comparison of management models found in different states. In this context, all the factors involved in the national railway sector are entered in one of the Authority, Infrastructure or Services boxes, according to their specific tasks. When a certain factor is involved in several specific tasks (e.g. Authority and Infrastructure) it is also possible to be entered in two or even all frames.

3.1. Organizational structure: the "Integrated model"

Specific to the integrated management model is usually a vertically integrated railway corporation, which controls the railway sector. The construction and administration of railway lines, transport services,

rolling stock, management and logistics are all organized by internal sectors of the integrated company.

This model integrated in most countries is in the possession of the state or a public institution. Authorities' interventions to regulate competition in the integrated management model remain limited, as there is little competition. This model if not regulated may conflict with European regulations regarding the liberalization of the transport market, if the management of the infrastructure and the transport operations are not separated.

In figure 3 is presented a simplified form of the integrated model.

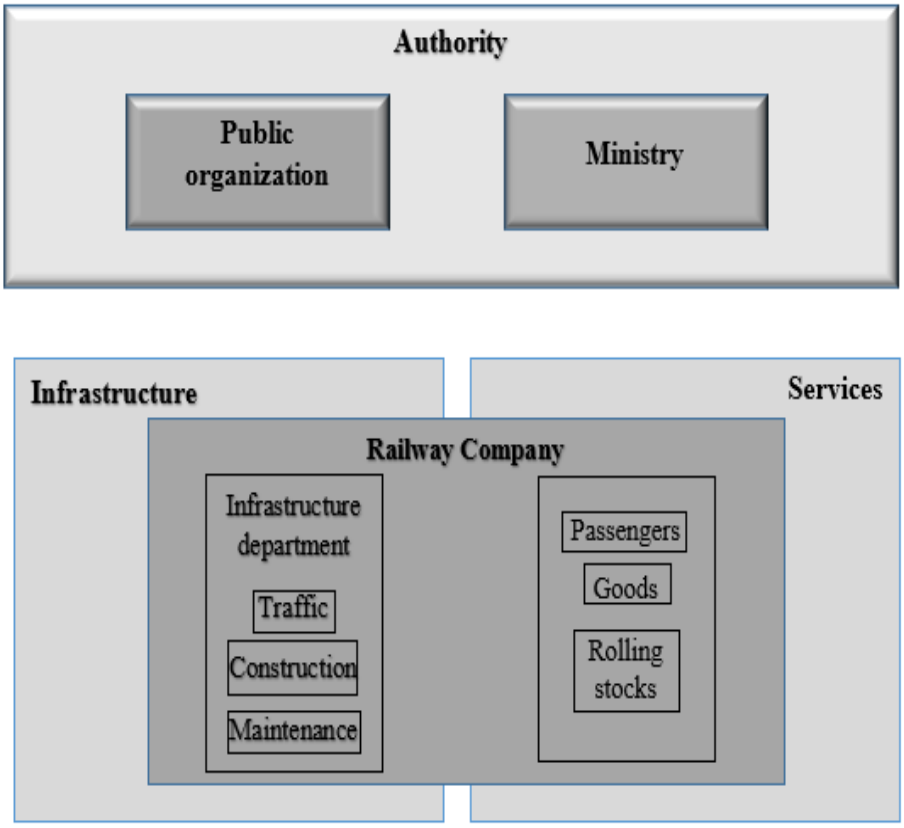

Figure 3. Integrated model (simplified).

3.2. „Holding" organizational structure

The holding structure in the railway sector can be defined as a 'conversion' model which is located between the vertically integrated and the vertically separated model. In this structure there is a financial delimitation between the infrastructure manager and the transport operators (Wolff, 2011).

However, the holding structure works like an "octopus", covering several branches. These branches are divided on different segments of a given area of activity (e.g. infrastructure management or transport services).

Although the Holding model could at first sight be similar to the integrated structure in terms of the overall structure, the most important and fundamental difference is the transformation of internal departments to subsystems within the holding company. These divisions resulting from the change are in most countries, independent and financially separate companies with a degree of entrepreneurial freedom.

A (simplified) holding system is shown in fig. 4 (Wolff, 2011).

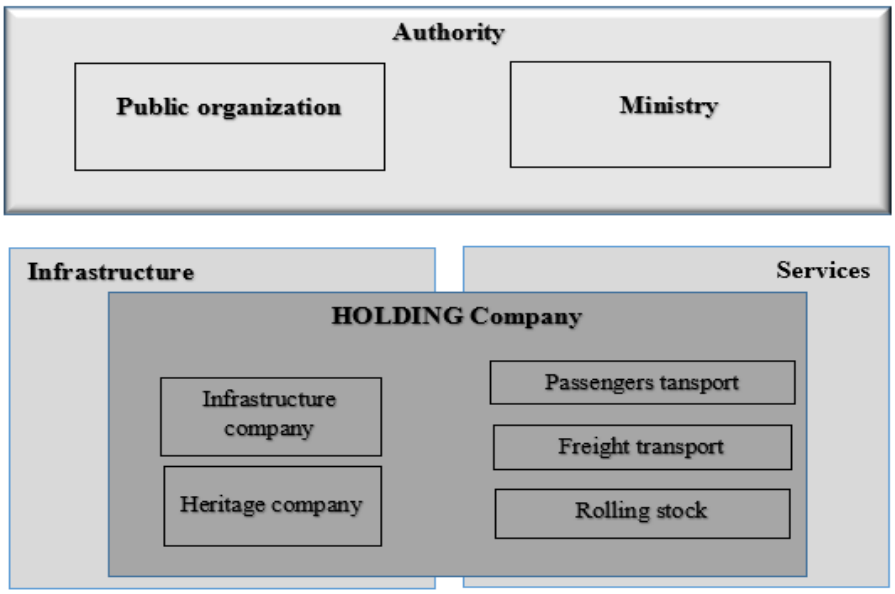

Figure 4. Holding model (simplified).

The organizational structure of Holding type is characterized by the financial separation between the infrastructure manager and the transport services. Therefore, the Holding model complies with E.U. regulations and is frequently used. We can say that a planned division of a company's work, structuring it into a holding organization, where each company has its own responsibilities, but the ultimate goal is the goal imposed by the holding company, leads to an increase in the quality of the entire system.

The main factor of economic growth is considered the division of labor, supporting free initiative and the need for free trade, which we can apply in the railway sector, liberalizing the transport market, increasing competitiveness, which also means an increase in service quality (Smith, 1992).

3.3. Organizational structure: the "Vertical separation model"

The vertical separation model is also quite common in Europe in different configurations, in Romania being implemented the "pure" form of the separation model (complete separation of companies, without being part of a common group), another example total separation is the UK.

Separation is seen as a way to encourage competition for the benefit of customers. Vertical unbundling is often supported in network industries, as it is supposed to be necessary to eliminate discrimination in access to infrastructure and therefore a solution to increase competition However, competition is not an objective, but simply a means of achieving a more efficient railway system. Any advantage resulting from the efficiency of competition must be compared with possible decreases in efficiency due to transaction costs between the infrastructure manager and the transport operator, reduced cost pressure and the negative impact on decision-making, especially for investments.

The analysis indicates that most states with a vertically separated railway system have fewer transport operators than those with vertical

integration. Vertical separation is also associated with a slower increase in rail freight traffic than vertical integration but indicates a faster increase in passenger traffic. The conclusions are therefore inconclusive and contradictory.

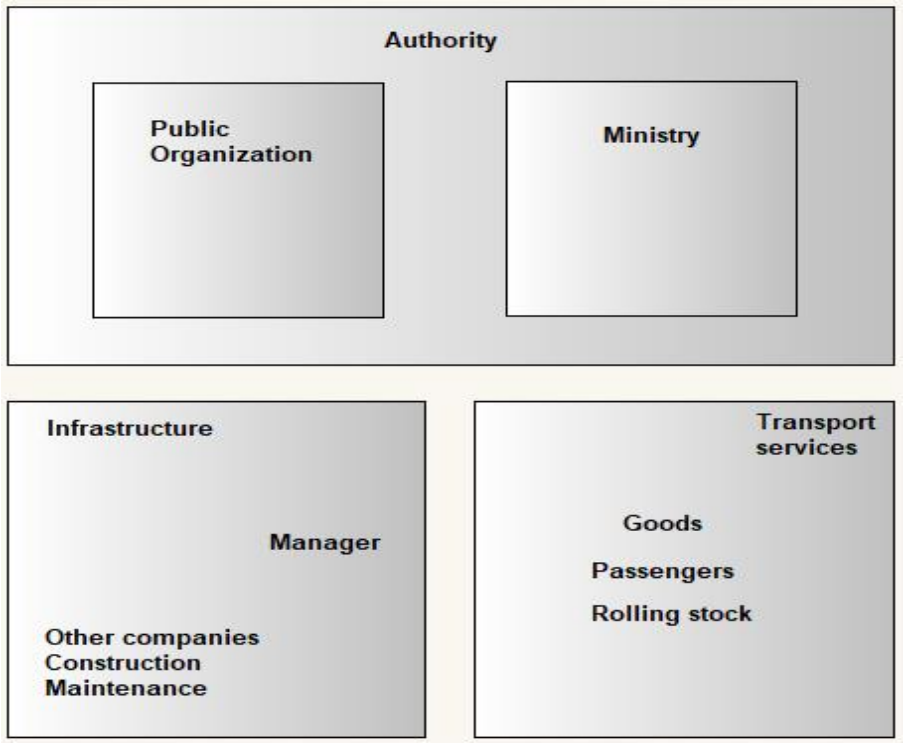

Figure 5. Vertical separation model (simplified).

The choice between vertical separation and integration may not be the most important factor in determining the degree of rail competition and increased traffic. Other factors include the efficiency of the regularity, the financial situation of the operator and the under-compensation for the provision of mandated public services.

Government support for infrastructure investments can also be important, given how damaged infrastructure affects the quality of

services, reliability and, ultimately, the competitiveness of the entire railway sector (Drew, 2006). The following European countries now have a similar organizational structure, vertical separation pattern: Romania; Bulgaria; UK; Lower Countries; Sweden; Denmark, etc.

Conclusions

In conclusion we can say:

- in the European Union the aim is to ensure the competition of the railway sector by separating the infrastructure manager from transport services;
- the model of a vertically integrated (operating) structure, when the railway infrastructure manager and the companies offer transport services belonging to a single group (holding), yields synergies and economies in shared facilities and services;
- maintaining an integrated railway management does not limit the liberalization of the railway market and the non-discriminatory access of carriers if it is well implemented. This can be confirmed by the number of railway companies providing passenger and freight transport services that have access to the transport market;
- the holding structure has a strong coordination of transport operators and infrastructure managers and ensures a long-term development of a single railway system;
- the holding structure allows to achieve a system synergy (efficient use of resources, a single management policy, etc.), cost savings and avoid duplication of functions.

The benefits of the integration are vital for a stable railway system. Separation causes serious economic and operational problems.

We can say that a planned division of a company's work, structuring it into a holding organization, where each company has its own responsibilities, the ultimate goal being the goal imposed by the owner company, leads to an increase in the quality of the entire system.

In conclusion, a quality, efficient management system plays a key role in improving the company's performance, because through it, one can better understand customer demands, identify ways to meet these demands, formulate organizational methods and control to minimize errors in activity.

An efficient transport system is a fundamental condition for the well-being and sustainable prosperity of the world. Mobility activates employment, growth, trade, etc. It also creates links between people and communities. However, our transportation systems and habits are not sustainable.

In the transport sector, research is essential for the development of innovative technologies and working methods that will bring about the changes needed to ensure low-cost mobility for society.

Following the studies, there is a need for continuous improvement of the railway industry, increasing the attractiveness of the service provided, reducing the gap in road transport, bringing to the fore a more environmentally friendly and safer mode of transport.

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