Article

Adaptation of the Management Model of Internationalization Processes in the Development of Railway Transport Activities

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Abstract: The paper analyzes the importance of the system of management of internationalization processes in developing railway transport. The article also highlights the synergistic effect of a multilevel management model in internationalization processes. The main purpose of the paper was to establish a new model of management of internationalization processes in the frame of railway transport development, presenting a related management model. The article analyzes possibilities of integration of the national railway transport sector into global railway networks and provides a model for the management of internationalization processes in developing railway transport. The developed model was approved in an expert survey conducted in application of a questionnaire method. The goal of the expert evaluation was to ascertain the suitability of the theoretical management model of internationalization processes. Expert evaluation consisting of a questionnaire, the evaluation of concordance of expert opinions, and the results obtained were used in the analysis. The research led to the development of a new railway transport model using the "alliance + cluster" system, which is based on the management of internationalization processes. Many theoretical sources on internationalization processes were analyzed with the aim to adapt main advantages of the internationalization theory in the field of development of railway transport and its prospects for further research.

Keywords: railway transport; internationalization processes; management; synergetic alliance; cluster

1. Introduction

Railway transport development is relevant due to the interaction between the growing need for communication and the limited physical and economical possibilities to meet it. Recently, railway transport has had to adequately respond to constantly changing global processes and business environments in the face of rapidly developing economic ties and intensifying trade. These circumstances have led to the need to search for new solutions and organizational forms that could facilitate successful development of railway transport at the national level, enhancing competitiveness with other modes of transport and creating added value.

With the development of economic ties and the creation of a uniform environment, attempts have been made to create a uniform railway transport environment. This, however, was impeded by the existing geopolitical problems; a great diversity of railway systems; legal, institutional, technical, and technological differences in different railway systems; absence of developed instruments

for harmonization of activities between business and railway transport; and a lack of efficient cooperation forms.

The circumstances having arisen in the course of internationalization presuppose the emergence of new methods of operation, organizational forms and principles, and an innovative approach to the processes of internationalization. This makes finding the most favorable solutions that will ensure a greater efficiency in the rail transport sector possible. Therefore, analyzing management aspects of internationalization processes in developing railway transport is important.

The article analyzes the possibilities of integration of the national railway transport sector into global railway networks and offers a model for the management of internationalization processes in developing railway transport.

To assess the suitability of the model, an expert evaluation was carried out. Experts were selected very carefully, taking into account their specific experience in the transportation and logistics business, especially those operating at a global scale. This condition is important because the "alliance + cluster" model is closely related to business development internationally and globally. The socio-economic return was evaluated on preconditional terms only. The article mainly focuses on the development of a new management model in the frame of internationalization processes. Experts were asked questions presuming their point of view to the improvement of cooperation possibilities between different institutions and business entities in order to determine a common approach to coordination of the transport/logistics development policy and the development of transport infrastructure in political, administrative, and business areas.

The functioning of the developed model is described on the basis of the example of Lithuanian railways in the Baltic region. However, the developed model could be used not only for activities of the Lithuanian railway sector, but also for neighboring countries aiming to optimize and develop the existing freight transport.

2. Materials and Methods

2.1. Analysis of Scientific Problems

The analysis of transport development-related problems revealed that railway transport is necessary in a multifaceted system where major regions of the world have autonomous needs and require longer-term efficiency of the railway transport market and its compatibility.

These circumstances are limited to the development of railway transport and hinder the formation of a coherent and a more comprehensive set of railway systems. When railway transport is not integrated into the common transport network, it loses competition, becomes less attractive, and leads to higher costs incurred by intermodal and multimodal transport [1]. Inefficient combined costs of large freight transport, low flexibility of transport services, and poor environmental conditions with the lowest-scale use of vehicles have been taken into account in the European Union (EU) transport policy.

Transportation of unit loads in the railway system in Europe has its own separate rules. There are associations (private, limited liability companies) in many countries, which are engaged in organizing intermodal transport. They bring together entities serving all types of unit loads, including railway companies, car carriers, and freight forwarders [2].

This is especially relevant for small countries, such as Lithuania, as they need to search for ways and forms to help them to integrate into international rail networks and to adapt to changes in railway transport processes in the changing business environment.

Ensuring interoperability of railway network infrastructure with other modes of transport is also very important. This allows synchronizing the use of modes of transport and provides a high level of control [3].

The growing demand for railway transport services also raises the issue of increasing railway transport capacity. Capacity building has been hampered by countries paying insufficient attention

to the investment policy and their sluggish allocation of funds for the development of infrastructure projects [4].

In the assessment of the nature of the railway transport sector in the context of internationalization, developing railway transport activities can be stated to be important in revealing the diversity of international business entities and international economic entities (companies, institutions, establishments, organizations, segments, and industries that, one way or another, interact and participate in global railway transport business processes).

The assessment of the railway transport sector's potential to integrate into the EU and the global market revealed a lack of capacity in infrastructure, rolling stock, information technology (IT) management, and, most importantly, weak business and partnership links in search of new forms of cooperation. In this context, there is a lack of both analysis of scientific literature and research work, examining the possibilities of using flexible forms of cooperation, such as clusters or alliances [5].

Therefore, when examining the practice of international cooperation, discussing clustering processes, which many researchers consider one of the most promising forms of economic development and cooperation, would be appropriate. When analyzing the practice of clustering processes, it should be noted that there are different practices of implementing clustering processes in different sectors. Entrepreneurship-promoting infrastructure has been created and developed in the last decade [6–8].

In the context of development of clustering processes, one of the important circumstances, i.e., the integration of clusters into alliances, should be distinguished. In individual cases, several clusters may form an alliance.

Alliances are associated with both internationalization and clustering. In terms of the form of organization of alliances, internationalization processes manifest through communication networks, i.e., development in the international area through various forms of market transactions and cooperation.

The key advantage of alliances is the possibility for companies to expand their market without risking or investing additional capital.

The criteria for partner selection are closely related to the need for higher quality alliance activities [9].

From the management perspective, the alliance model offers opportunities to develop a unified traffic management system not only in certain regions, but also in a larger area or even in the global railway infrastructure network. Such a principle within an alliance significantly simplifies and speeds up decision-making processes [10].

One of the key strengths of an alliance is its branding policy, which presents its values and strengths that are relevant to customers and help develop joint marketing [11,12].

The formation of an alliance is a personal matter, as its activities are based on the principles of building more personal relations and the resulting business connections. Relations are built on the basis of mutual trust, which form the basis of all activities of an alliance. Membership in an alliance provides a competitive advantage and strengthens the bargaining power [13].

The analysis of scientific literature sources revealed that the most extensive experience in the activities of alliances operating in the transport sector comes from the aviation sector, and it is discussed in the railway transport sector.

A railway alliance also includes companies providing specific services, such as shunting services and traffic management companies.

It should also be noted that in this case, an integrated railway company model is much more efficient, with one railway company managing many areas in one system, which would make managing service provision processes easier compared to combining activities of individual railway companies specializing in narrower industries [14].

In the assessment of the possibilities of forming a railway transport alliance, it should be noted that the experience of establishing railway alliances presented in scientific literature sources is ambiguous and diverse.

The formation of an alliance can affect a decision to attract activities to a particular region that has accumulated the necessary potential, capacities, and resources.

Scientific literature suggests that the main goal of clustering is to accumulate the necessary competencies to be disseminated throughout the value chain and to be superior to competitors in all parts thereof [15].

In summary, the analysis of the problems of railway transport development in terms of internationalization allowed distinguishing the following theoretical directions: The theory of internationalization processes, the theory of the Uppsala model (U—model), the theory of globalization processes, the theory of multilevel management, the theory of communication network, and theories of clustering processes (Table 1).

Table 1. Summary of the analysis of scientific literature.

Theoretical Direction	Key Aspects	Scientists	Manifestations in the Railway Transport
Theory of internationalization processes	Development of new trends of economic and international relations in the international environment.	[16]	Application of new organizational forms in the development of activities in the international space.
Theory of Uppsala model (U—model)	Processes of dissemination of innovations and new ideas in international markets.	[17–21]	New ideas from international partners involved in the transport organization process.
Theory of globalization processes	Development of regional and international cooperation and relations.	[16,22,23]	Search for new principles of work organization under globalization conditions.
Theory of multi-level management	Institutional cooperation, strengthening and development of relations, synergy effects.	[24]	Development of activities in a single network. Synergistic effects.
Theory of communication network	Business network development.	[15,25–27]	Importance of communication and knowledge exchange.
Theories of clustering processes	Network, a set of unique knowledge, resources and connections.	[8,28–30]	Combining freight flows, efficiency of the transport connection chain.

It was determined that the most efficient rail transportation processes and a high-quality coordination of logistics processes under internationalization conditions are achieved in the presence of forms of cooperation managed in a coordinated manner [28].

Therefore, analyzing the importance of the system of management of internationalization processes in developing railway transport and the synergistic effects of the multilevel management model in internationalization processes is important.

2.2. Importance of the System of Management of Internationalization Processes in Developing Railway Transport

The process of market liberation is an inevitable step toward a modern and competitive market. This process offers the railway sector the last chance to transform railway transport into a modern, user-oriented, and cost-efficient system [31]. Also, the success of a company depends on its organizational structure that makes doing business much easier owing to a clearly defined hierarchy and responsibilities that lead to the ultimate goal—freight transport [32].

The management of railway transport internationalization processes both in international and national markets requires an efficient joint management system capable of combining parts or elements of railway transport and other associated services into a single whole. The structure operating on the system basis was selected in light of the adaptability of the model intended for the management of internationalization processes in developing railway transport and assumptions that such a model may function in the international and national markets. The general system theory states that a system element, which is the smallest unit indivisible in the analyzed respect, is the main part of the system [33,34].

System elements are interdependent and operate as a synchronized system. The basis of its operation includes the development of the railway transport sector by consolidating international

and national railway transport activities into formations and a single whole. The basis of the system consists of the totality of alliance and cluster elements combined into a single whole and operating as an integral mutually harmonized mechanism in the railway corridor. On the one hand, the system performs a specific function that enables consolidation into element formations. On the other hand, it has a common feature that allows contributing directly or by functioning as element formations to the achievement of a common goal of the system. Based on these general features, elements or their formations may be consolidated into a single whole [35].

In order to manage the system efficiently, to organize activities, and to pursue its goal, "identifying" and describing constituent parts of the system and the principles of interaction between them is necessary. This system may also be viewed as an instrument for achieving the main goal of the railway transport sector. In pursuit of the main goal of enhancing efficiency in the railway transport, a railway undertaking that brings together the related elements into a single whole is selected as the system center. This ensures the functioning of a strong system—alliance, corridor, and cluster—with strong links, as well as its stability, integrity, and role as determinants of the quality of the railway transport service.

When it comes to organizing activities of the system, strategic management aspects that are especially relevant in developing railway transport internationally should be taken into account, also considering the planning, implementation, and control over the interaction of a railway transport undertaking with enterprises associated with its activity that are elements of the system, and also the planning of the control of general activities and control over the implementation thereof [5,36]. According to the author, activities of a railway transport undertaking and its associated companies are conducted in accordance with the principles of centralized or corporate management. Based on practice, railway transport companies with a huge potential and resources only are capable of acting successfully in international markets, whereas small companies with poorly developed activities are incapable of doing business successfully. Therefore, the management of internationalization processes in developing railway transport activities internationally plays an important role and, to this effect, the selection of adequate cooperation forms is necessary. The main railway transport company is a controlling undertaking that may affect, adjust, and control the adoption of strategic decisions and execution thereof. Meanwhile, in order to implement strategic goals of a central railway undertaking, a strategic business entity may be established in a foreign country and operate within the formation of a system alliance under a common trademark. A company engaged in strategic activities may operate as an equivalent constituent part of the alliance together with other alliance partners. It is noteworthy that centralized planning is done within this system, which is initiated and managed by the central railway transport undertaking. Communication between business partners within the alliance and the cluster takes place from the top down, and directions, recommendations, tasks, etc. are dictated from the center. Each entity of the alliance or cluster coordinates all strategic actions and plans, as well as actions and plans associated with activities of the alliance and the cluster with the central undertaking, receiving its approval. This way, a synergistic effect is obtained between the central railway undertaking and entities associated with business entities of the alliance and the cluster that manifests itself in a common goal, decision, and result.

In order to clarify the peculiarities of the management of internationalization processes when considering new forms of railway transport management, analyzing synergistic effects of the multilevel management model is important.

2.3. Synergistic Effects of the Multilevel Management Model in Internationalization Processes

With regard to the development processes of modern business and railway transport, challenges and needs to activate and to develop different organizational forms distinguished for innovations, new forms of business organization, and new cooperation methods are encountered. These issues are especially relevant for railway transport, yet, scientific knowledge in this field is very scarce. Moreover, there is a lack of scientific research enabling justifying the need for the development of new organizational forms for international cooperation.

One of the main conditions of the multilevel management model is the synergetic effects necessary for targeted business development manifesting in the development of business in the international market [37,38].

A multilevel management concept is based on the fact that the management mechanism becomes more sophisticated in the management process developed in the international environment when expanding activities from local-significance business processes to global-level processes (Figure 1). Stakeholders face difficulties in coordinating, networking, building institutions, and allocating territories. An increasing scope of business volumes makes coordinating mutual actions and solutions more problematic. Therefore, all stakeholders participate in an integral and consistently arranged management process.
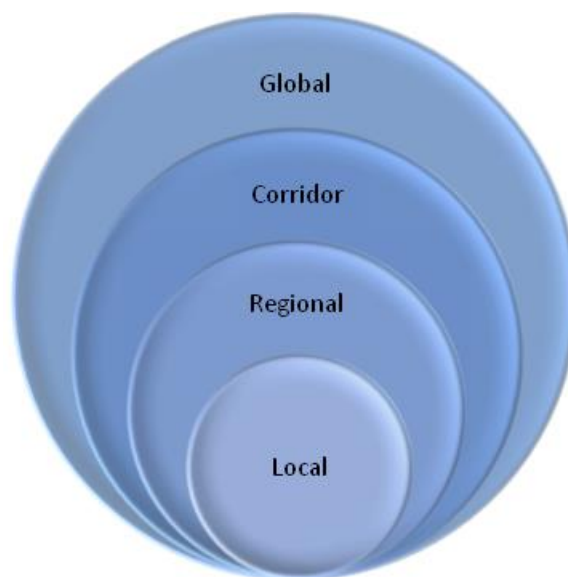

Figure 1. Multilevel model management levels [39].

The multilevel management model may be defined as a central management mechanism, which adopts adequate decisions, primarily on the local level and, subsequently, on the regional level [40].

The multilevel management model allows creating a flexible and efficiently operating management system deployed in a large territory.

The system can cover dozens of activity fields. Multilevel management distinguishes a country in the context of internationalization processes in terms of the efficiency of mutual understanding and improvement of the decision quality in the management hierarchy context. In this case, the concept of a management model is based on two dimensions that emerged in the research conducted by Hughe and Marks [41].

The researchers [42] drew attention to the fact that multilevel management may weaken the democratic value and stability (in the case of decision making). In this case, however, there must be a high level of mutual trust and openness. The success of cooperation in this management form depends on the mentality of the prevailing culture, approach, management, etc., which forms a favorable environment for success in cooperation [41,43]. It could also render environmentally friendly tools decreasing railway pollution by using new types of fuels like hydrogen and different kinds of biodiesel and their mixtures [44–47]. Multilevel management allows affecting processes associated with border crossing procedures, solving problems among different regions when railway corridors cross territories of different political affiliations.

Airaksinen and Haveri [48], who analyzed multilevel management theories, compared this management model to the development of activity in one network.

When analyzing links of corridors and networks on the international level in greater detail, it should be noted that a multilevel management model is more efficient for solving organizational problems and issues of cooperation among state authorities (governments, ministries, municipalities, and regional administrations) that may be associated with the specificity of regional cooperation, identifying priorities for enhancing competitiveness in the region and creating proper infrastructure for organizing transportation.

2.4. Research Methods of the Internationalization Process Model in the Development of Railway Transport

Research results and their discussion will be described based on the following logical sequence and applied methodology: (1) The developed model of railway transport for the management of internationalization processes and description of the principles of its operation and (2) an expert evaluation of the suitability of the developed model analyzing Lithuanian railways.

To evaluate the suitability of the model, one of the multiple criteria decision making (MCDM) categories, namely, the multiple attribute decision making (MADM), was chosen. It examines alternatives that are a part of the finite set of solutions, discrete optimization methods for solution search, and methods based on the multidimensional distance measurement (SAW—Simple Additive Weighting, AHP—Analytic Hierarchy Process, TOPSIS—Technique for Order Preference by Similarity to Ideal Solution, ELECTRE—ELimination and Choice Expressing REality, PROMETHEE—Preference Ranking Organization Method for Enrichment Evaluations, etc.). The analysis is based on the AHP method.

An expert survey in the form of a questionnaire was used to confirm the developed model. An expert is a person who is most competent and has the most reliable and sufficiently comprehensive information on the problem being analyzed owing to his or her professional or life experience [49,50].

The goal of the expert evaluation was to ascertain the suitability of the theoretical management model of internationalization processes.

An expert evaluation that consists of a questionnaire expert survey, the evaluation of concordance of expert opinions, and the results obtained was the planned method of the survey.

An expert group *n* evaluated quantitatively objects *m*. Evaluations consisted of the matrix of lines *n* and columns *m* [51] (Table 2). Any measurement scale could be used for evaluations, including indicator units, fractions of units, percent, or a 10-point scale. To calculate the coefficient of concordance, the ranking of expert indicators was used.

Table 2. Evaluation table.

Expert Code		Indicator Marking, $j = 1, 2, \ldots, m$				
		X_1	X_2	X_3	$\ldots$	X_m
	E_1	R_{11}	R_{12}	R_{13}	$\ldots$	R_{1m}
	E_2	R_{21}	R_{22}	R_{23}	$\ldots$	R_{2m}
$I = 1, 2, \ldots, n$	E_3	R_{31}	R_{32}	R_{33}	$\ldots$	R_{3m}
	$\ldots$	$\ldots$	$\ldots$	$\ldots$	$\ldots$	$\ldots$
	E_n	R_{n1}	R_{n2}	R_{n3}	$\ldots$	R_{nm}

Ranking is a procedure in which the most important indicator is ranked as the first one, the second indicator as the second one, and the last indicator is ranked as *m* (*m* is the number of comparative indicators). Having calculated expert indicators, concordance of their opinions was determined using the Kendall's ranking coefficient of concordance *W*.

Kendall's coefficient of concordance was calculated as follows (Equation (1)):

$$R_j = \sum_{i=1}^{n} R_{ij} \tag{1}$$

where R is the sums of squares S (dispersion) (Equation (2)):

$$S = \sum_{j=1}^{m} \left(R_j - \overline{R} \right)^2 . \tag{2}$$

General mean was calculated according to the Equation (3):

$$\overline{R} = \frac{\sum\limits_{j=1}^{m} R_{ij}}{m} = \frac{\sum\limits_{i=1}^{n} \sum\limits_{j=1}^{m} R_{ij}}{m} \tag{3}$$

Sum of rankings of m indicators by all n experts is (Equation (4)):

$$\sum_{i=1}^{n} R_{ij} = \frac{1}{2} n(m+1) \tag{4}$$

and general mean is (Equation (5)):

$$\overline{R} = \frac{1}{2} n(m+1). \tag{5}$$

Average ranking R of each criterion was obtained by dividing the sum of rankings by the number of experts (Equation (6)):

$$\overline{R}_j = \frac{\sum\limits_{i=1}^{n} R_{ij}}{n} \tag{6}$$

where R is the ranking given by j-expert to i criterion and n is the number of experts.

If S is a real sum of squares calculated according to Equation (2), then the coefficient of concordance, in the absence of linked rankings, is defined by the ratio between the obtained S and the respective biggest S (Equation (7)).

$$W = \frac{12S}{n^2 m(m^2 - 1)} = \frac{12S}{n^2(m^3 - m)} \tag{7}$$

The sum of squares S of deviations R of the rankings of each criterion from each average ranking was calculated according to the Equation (8):

$$S = \sum_{j=1}^{m} \left(\sum_{i=1}^{n} R_{ij} = \frac{1}{2} n(m+1) \right)^2 \tag{8}$$

where m is the number of criteria ($i = 1, 2, \ldots, m$) and n is the number of experts ($j = 1, 2, \ldots, n$).

Using the formulae of known natural numbers and sums of their squares allows us to easily prove that in the ideally consistent case the sum of squares S is even (Equation (9)).

$$S_{\max} = \frac{n^2 m \left(m^2 - 1 \right)}{12} \tag{9}$$

The coefficient of concordance may be applied in practice, if its limit value has been determined, when expert evaluations may be considered consistent. If the number of criteria is $m > 7$, the importance of the coefficient of concordance may be determined using χ^2 Pearson's criterion (Equation (10)).

$$\chi^2 = n(m-1)W = \frac{12S}{nm(m+1)} \tag{10}$$

A random value is distributed according to χ^2 distribution at $v = m - 1$ degree of freedom. According to the selected importance level of alpha ix χ^2 distribution table at $v = m - 2$ degree of

freedom, a critical value is found. If the found χ^2 value calculated according to Equation (10) is bigger than χ^2_{kr}, this means that expert evaluations are consistent.

The smallest value of the coefficient of concordance $W_{\min}$ at which opinions of all n experts about the quality of the object being analyzed composed of m comparative criteria with the determined (necessary) importance level α and at the degree of freedom $v = n - 1$ may be deemed consistent may be calculated using the following Equation (11):

$$W_{\min} = \frac{\chi^2_{v,\alpha}}{n(m-1)} \tag{11}$$

Average rankings R do not show that one ranking is more important than others. To this effect, importance indicators Q may be used.

Importance indicators are determined as follows: Average ranking R of each criterion is divided by the constant value of all criteria of the object—sum of rankings, calculating q value this way (Equation (12)):

$$\overline{q}_j = \frac{\overline{R}_j}{\sum\limits_{j=1}^{m} R_j}. \tag{12}$$

The sum of q estimates calculated according to Equation (12) is equal to 1. The most important is the criterion the calculated value whereof is the smallest. For each criterion, a reverse q value is calculated (Equation (13)):

$$d_j = 1 - \overline{q}_j = 1 - \frac{\overline{R}_j}{\sum\limits_{j=1}^{m} R_j}. \tag{13}$$

The sum of calculated D estimates is equal to $n - 1$.

Finally, importance indicators Q of the criteria the sum of which is equal to one are calculated (Equation (14)).

$$Q_j = \frac{d_j}{\sum\limits_{j=1}^{m} d_j} = \frac{d_j}{m-1}. \tag{14}$$

Importance of criteria of the object evaluated by experts by equating their sum to one may be determined by calculating the importance indicator Q of each criterion according to the Equation (15):

$$Q'_j = \frac{(m+1) - \overline{R}_j}{\sum\limits_{j=1}^{m} R_j}, \tag{15}$$

where m is the number of indicators showing the object's properties and R is the average ranking of j criterion calculated according to Equation (6).

An expert survey was conducted in accordance with the above methodology. Eight experts from different business, research and state institutions, who have worked in transport and logistics for five years at the least, took part in the survey. The experts were chosen taking into account their long-term professional experience in international transportation and logistics business. The experts have been working in famous and widely known companies, which affect global logistics and transportation chains. The concept of the "alliance + cluster" model was considered in the global dimension, thus there were not many experts that could be chosen. The weight of an expert's opinion is significant because of large volumes of transported freight and the developed international trade network.

3. Results and Discussion

3.1. Railway Transport Model Intended for the Management of Internationalization Processes

The examined sources of scientific literature related to the management of internationalization processes revealed a lack of models in the railway transport sector for the management of internationalization processes, which could be used to increase the efficiency of railway transport activities in the international area. The management of rail transport internationalization processes in international and national markets requires having an effective integrated management system that could integrate separate parts or elements of rail transport and other related services into a single system. An operating system was chosen taking into account the applicability of the model for the management of internationalization processes in the development of railway transport and the assumptions that such a model can operate both nationally and internationally.

Parts of the system are interconnected and function as an integrated and synchronized system, the basis of which is the development of the activities of the railway transport sector by merging international and national railway transport activities in organizational forms. The system "alliance + cluster" is based on the unity of elements of the alliance and cluster organizational forms, which are interconnected into a single functioning mechanism by a railway corridor and act as an integral mutually coordinated unit.

The system performs a specific function, which allows connecting to a system of related elements; on the other hand, a unity or a system is targeted at achieving one goal. Based on this general approach, united elements can be combined into a single straight formation having one strategic goal and the same basis for development.

According to practice, railway companies with a high potential and resources are able to operate successfully in international markets, while small and underdeveloped undertakings cannot do so. Therefore, management of internationalization processes plays an important role in the development of rail transport activities at the international level and requires choosing appropriate forms of cooperation. It can be argued that in the practice of international business development, strategically large railway companies that have a significant influence in the market can usually apply a two-level hierarchical structure: The central and the strategic business units.

A railway undertaking, which is a leading party, can affect the creation of added value for the entire system by planning and controlling the strategic development and operational processes of the related companies or elements of the system. It should be noted that in the "alliance + cluster" system, railway undertakings initiate and coordinate centralized planning. Each element of an alliance or a cluster coordinate and approve all strategic actions and plans related to the activities of the alliance and the cluster with the central company.

The common objectives of the system and the railway undertaking are achieved by implementing the objectives of individual business partners of the system, based on bilateral agreements, reflecting a single objective of the system.

A railway company, which is also the founder of the alliance and the cluster, is chosen as the central governing body [52].

The railway company, together with other members of the alliance and the cluster, develops a common business development strategy, pursues a unified investment policy by defining priorities for the development of joint activities, and implements strategic development control. This way, general operational guidelines are laid down with the created policy for the development of the activities of the entity. All members of the entity use the same communication channels. The railway company, logistics terminal, freight forwarder, IT company, and marketing and analysis company operating in the alliance must develop a common freight flow management system with the components of freight supply, transport routes, delivery times, and transport process control. Cargo data must be stored in a common storage and processing medium and processed using the same software, the same databases, and the same data processing mechanisms. The data logger must be able

to store information for manufacturers and shippers so that they can manage information on the existing shipments, their delivery needs, and other relevant information. One of the communication channels should be intended for customers and used to assess the service quality. Customers must also have access to an information channel that provides information on the condition of the goods being transported.

The activities and relations between the central railway undertaking and elements of the "alliance + cluster" system entity are carried out on the basis of corporate governance. The following key concepts are at the heart of corporate governance: Compliance with the law, transparency and accountability, and performance of functions of managers in observance of laws, regulations, and the governance policy.

The model developed for the management of internationalization processes in the development of railway transport (Figure 2) is based on the principle of corporate governance. This management principle was chosen because it is most closely related to the concept of the "alliance + cluster" system and can be most easily implemented in international and national business environments.
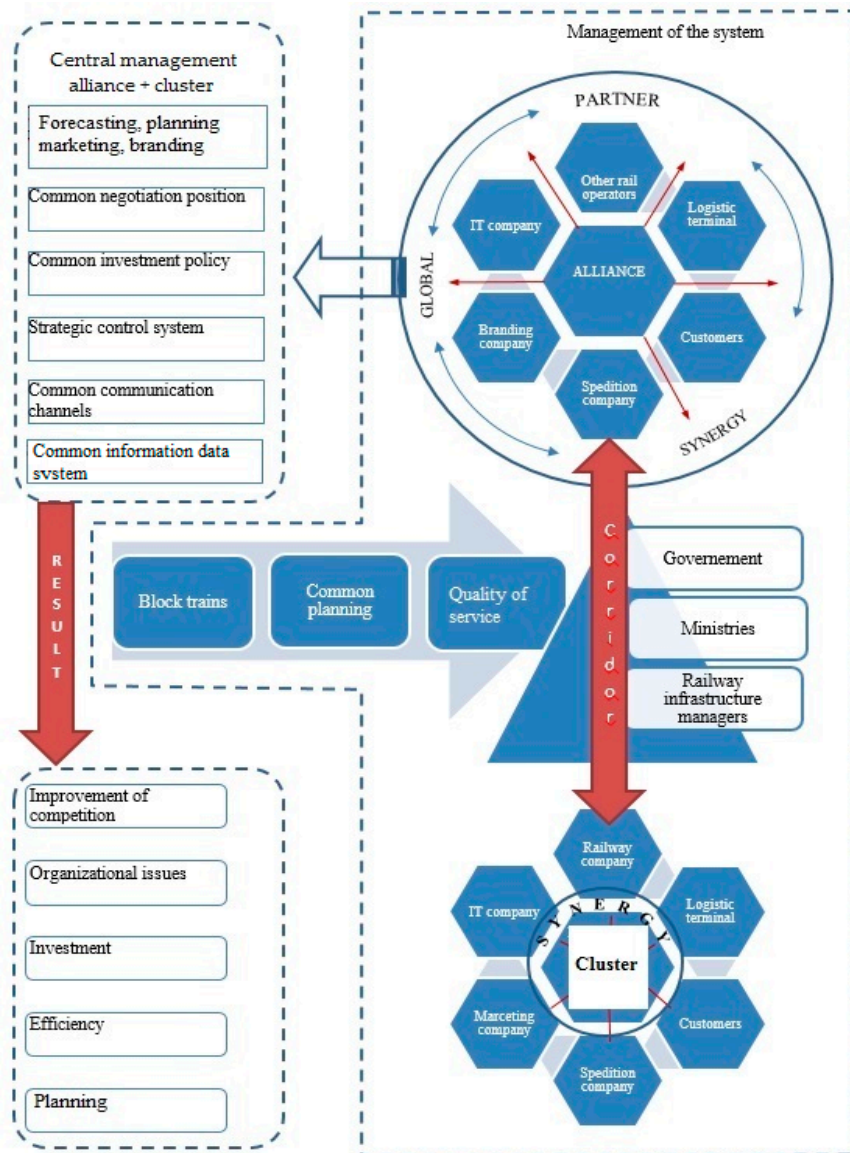

Figure 2. Model for the management of internationalization processes in developing railway transport.

In the case of the presented model, the essence of management is formed by developing the overall strategy, which is implemented in coordination with a railway undertaking.

The model shows the center of an entity as an alliance on one side and as a cluster on the other side. The center, along with other related system components, including a logistics terminal, an information technology company, a forwarding company, and a marketing and analysis company, is one of the pillars of the model. At the marked pillar of the model, freight transportation by rail is coordinated jointly by all participants in transport units and the freight collection process, sharing knowledge and responsibilities, distributing freight flows to shuttle trains, and periodically sending them from one pillar of the system to another.

The model system allows for the management and regulation of cargo flows, information collection, and problem solving by establishing a unified order management, information transmission, and control execution center operating within the information systems company, which coordinates actions of all relevant system participants and provides timely solutions in nonstandard situations.

When implementing the strategy of the system, planning the monitoring and control of its implementation is necessary.

Monitoring and control procedures are closely interrelated, and the system that unites them is a strategic control system defined as a system for selecting, setting, and providing feedback on controlled parameters to assess how individual elements of the system perform their responsibilities and delegated tasks, the efficiency of use of resources (human resources), and the implementation of investments. The strategic control system performs the following key functions: Monitors the actual results of strategy implementation, evaluates the performance of individual system elements, monitors changes in the business environment and assesses their compliance with the assumptions adopted in the strategy, provides feedback to resources in a timely manner, revises the strategy after amendments have been made thereto, and provides for incentives that motivate the elements of the system to focus their joint efforts on the successful implementation of the strategy.

For the management of the rail transport corridor, a general corridor management structure is provided for, which is important for the formation of the railway corridor between different geographical areas, e.g., between the pillars of the "alliance + cluster" system. The general governance structure of the rail corridor, which is an integral part of the management model of the "alliance + cluster" system, allows allocating train running time and coordinating train schedule. The management of the railway corridor involves bodies of state and various international associations that control the allocation of infrastructure capacity, regulate freight flows, develop transport rules, and develop the transport tariff policy.

The description of the "alliance + cluster" model can be applied universally, i.e., in the rail transport sector, in general, and, in particular, railway undertakings.

3.2. Evaluation of Research of the Model for Further Development of Railway Transport

The model presented in Section 3.1 is related to the integration of the developed railway transport system into international/global transport, business, and logistics network. The alliance management form represents a united regional business unit and an efficient tool to reach business players in other regions of the world.

Development of activities in the foreign market should be based on principles of the centralized or corporate management of the "alliance + cluster" system [52]. Management of internationalization processes in developing railway transport activities internationally plays an important role; therefore, selecting suitable cooperation forms is necessary. Within the "alliance + cluster" system, a central railway undertaking should engage in centralized planning.

When developing activities abroad, the "alliance + cluster" system allows assessing the size of the market, the application of information technologies, and the concept of a new, more attractive service that would provide more advantages over competitors.

Combined efforts of system elements in the alliance are likely to bring better visibility in the market, making it easier for alliance elements to become established in the market and to promote their trademark more efficiently by pooling their efforts and resources. One of the most important and targeted emphasis of an alliance is the direction of the Baltic region and the Lithuanian platform of intermodal transport, also a complex of logistics services, good accessibility, and a convenient geographical location, opportunities for further clustering processes by subordinating logistics centers through agglomeration in Latvia and Estonia.

In light of the above, the model presented in Section 3.1 would change slightly, as it would illustrate specific business units, i.e., the central management "alliance + cluster" would be replaced by the central management "alliance + cluster" "Go-Baltic LT" and the cluster central railway company in Lithuania would appear instead of a cluster.

It is very important to note that the theoretical part does not relate to the EU part only. The European transport policy model is presented as an exclusive international-scale example because there are no other examples that could help to efficiently coordinate transport chain development between different transport systems.

The described principle of the "alliance + cluster" system for the organization of activities makes organizing activities in any foreign market possible. In this case, the market of China has been chosen. A network of railway transport and logistics service providers may be formed inside China.

The system concept may be applied twofold: On the one hand, a logistics terminal in China existing in the alliance may be beneficial as an alliance element; on the other hand, this terminal may be linked with other terminals operating in China. This way, the system model performs a double function characteristic of the organizational form in both the alliance and the cluster in the local market.

However, the aspect of transit countries is irrelevant within the scope of the article, because the idea of the model is about the development of the "hub and spoke" system approach.

Lithuania was taken as an example of an integrated unit of the "alliance + cluster" system in the Baltic sea region. The country depends on the alliances of the "North–South" and "East–West" crossroads and works as one of the business units under the organizational cluster model.

Therefore, based on practice, an example of Lithuanian Railways and the Chinese railway undertaking China Railway Company (CRC) will be analyzed.

Lithuanian Railways and the Chinese railway undertaking CRC agree on the operation of shuttle trains between China and Lithuania choosing a route acceptable for both parties. The Chinese railway undertaking CRC adjusts the schedule of shuttle trains from China to Lithuania. Train sets are arranged in the port of Harbin, which is the final train destination in the territory of China. From here, trains are directed to Lithuania. A system for the control of train schedules and freight delivery operates on the entire train route.

There is a uniform IT system in place in logistics terminals in China and Lithuania for monitoring the general process of freight circulation and train schedule.

When it comes to forwarding services, a company operating globally, which has a division in the city of Harbin and can physically monitor and control the process of carriage, collection, and distribution of goods, is selected. "SSL—Spedition Services Limited" could be chosen for this role. This company has extensive experience in organizing the delivery of goods from Asia to EU and Commonwealth of Independent States (CIS) countries.

State authorities can solve the issue of railway corridors in the system of the model, i.e., an agreement on compatibility between railway corridors and the use of financial instruments is reached at governmental level.

The concept of EU rail freight corridors was taken into account as the main component in the corridor's management model, which can be used in the international and the global area. This is an example how a transportation model can be managed between governments and business entities. This is the principle approach to connecting different parts of the world removing administrative,

infrastructure, social, and national obstacles, which do not allow creating a single international trade and transport area without any borders.

The developed model was used in the assessment of practical applicability in the Baltic region, following the example of Lithuania.

Based on an expert survey, which now reflects the strategic planning process of Lithuanian Railways, it turned out that 88 percent of respondents agreed that the quality of strategic planning is extremely important for the efficiency of Lithuanian Railway transport activities.

According to them, strategic planning issues are equally important in the internationalization process of the Lithuanian railway transport. Most of the experts agreed that the Lithuanian railway transport sector is capable of improving strategic planning using the internationalization instruments.

Experts from Lithuania were asked what external factors, in their opinion, affect the planning of the Lithuanian Railway activities, and all the respondents unanimously agreed that political-economic factors have the greatest impact on strategic planning of activities of the Lithuanian railway transport sector. Sixty-three percent of the respondents surveyed believed that technological factors are of similar importance, and only 37 percent of the respondents stated that social factors have an impact on strategic activity planning of the Lithuanian railway transport sector.

On the other hand, in the internationalization process, when penetrating into foreign markets, the Lithuanian railway transport is affected by both internal and external factors. The experts surveyed indicated that the level of demand in the railway transport market, the level of maturity of an undertaking to develop activities, and the competitive environment have the greatest impact on penetration into a foreign market. According to the experts, internal factors, such as favorable business environment conditions or experience of an undertaking to work in foreign markets, have a lesser impact. All this comes from a complex internationalization experience, which a railway transport undertaking develops while working in the international market.

The experts were asked to evaluate strategic development directions of the Lithuanian railway transport in the internationalization process. To encode the criteria, questionnaire data of eight experts were written down randomly in Table 3: To foster institutional reforms seeking (a) to organize integration of the railway transport sector into business processes more efficiently by changing the concept and principles of management; (b) to promote transit transportation by giving priority to complex development of transport technologies and carriage services with an aim to expand the range of transit services; (c) to initiate a new concept of operating shuttle trains from Lithuania by emphasizing regularity and reliability of shuttle trains and eliminating the probability of delays; (d) to pursue changing the policy of intermodal carriages in Lithuania by emphasizing the strengthening of the role of the railway transport in long-distance freight carriages among Lithuanian and other logistics terminals in the global space; (e) to emphasize the role of public logistics terminals set up in Lithuania for utilizing capacities of the railway transport; (f) to integrate into the international railway corridor network by ensuring all functions necessary for activities of the corridors; (g) to integrate Lithuanian logistics terminals into a global chain of logistics terminals, and to blend with IT systems for control and coordination of freight carriages functioning in global logistics centers; (h) to improve cooperation between the private and the public sectors in a targeted way by improving the management of internationalization processes in the railways' development process; (i) to emphasize the role of Lithuania as a EU border and an external state, for links with the Eastern market.

Table 3. Table of received evaluation rankings.

	Factor Encoding Symbol (m = 9)								
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**
$\sum_{i=1}^{n} R_{ij}$	13	24	38	43	55	59	67	29	32
$\overline{R}_j = \frac{\sum_{i=1}^{n} R_{ij}}{n}$	1625	3	4750	5375	6875	7375	8375	3625	4
$\sum_{i=1}^{n} R_{ij} = \frac{1}{2}n(m+1)$	−27	−16	−2	3	15	19	27	−11	−8
$\left(\sum_{i=1}^{n} R_{ij} = \frac{1}{2}n(m+1)\right)^2$	729	256	4	9	225	361	729	121	64

The coefficient of concordance was calculated in the absence of linked rankings (Equation (16)).

$$W = \frac{12S}{n^2(m^3 - m)} = \frac{12 \times 2498}{8^2(9^3 - 9)} = 0.6523. \tag{16}$$

The number of factors that affect the directions of development of the strategic alternative was calculated $m > 7$. Then, calculating the weight of the coefficient of concordance, we get a random value (Equation (17)).

$$\chi^2 = n(m-1)W = \frac{12S}{nm(m+1)} = \frac{12 \times 2498}{8 \times 9(9+1)} = 41.63. \tag{17}$$

The calculated value 41.63 of χ^2 is bigger than the critical value χ^2_{kr} (equal to 15.5073). Therefore, an opinion of the respondents is deemed consistent, whereas average rankings show a general opinion of the experts.

The calculated smallest value of the coefficient of concordance W_{min} shows that opinions of all eight respondents on the nine factors affecting the directions of development of the strategic alternative are still considered consistent (Equation (18)).

$$W_{min} = \frac{\chi^2_{v,\alpha}}{n(m-1)} = \frac{15.5073}{8(9-1)} = 0.2423 < 0.6523. \tag{18}$$

The calculations made reveal that opinions of the eight respondents on the nine factors that affect the directions of development of the strategic alternative coincide, and the opinion of the experts is consistent.

Importance indicators Q_j of the factors affecting the strategic development directions of the railway transport in the internationalization process are calculated. Data obtained are provided in Table 4.

Table 4. Table of ranking evaluations.

Indicator Marking	Factor Encoding Symbol									Sum
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	
$\overline{q}_j$	0.0361	0.0667	0.1056	0.1194	0.1528	0.1639	0.1861	0.0806	0.0889	1
d_j	0.9639	0.9333	0.8944	0.8806	0.8472	0.8361	0.8139	0.9194	0.9111	8
Q_j	0.1205	0.1167	0.1118	0.1101	0.1059	0.1045	0.1017	0.1149	0.1139	1
Q'_j	0.1861	0.1556	0.1167	0.1028	0.0694	0.0583	0.0361	0.1417	0.1333	1
Arrangement of factors	1	2	5	6	7	8	9	3	4	

Table 4 provides all factors and their arrangement order from the most important to the least important.

Factors affecting successful operation of the system "alliance + cluster" in the internationalization processes of Lithuanian Railways and importance indicators, Q_j, were calculated. The data obtained are provided in Figure 3.
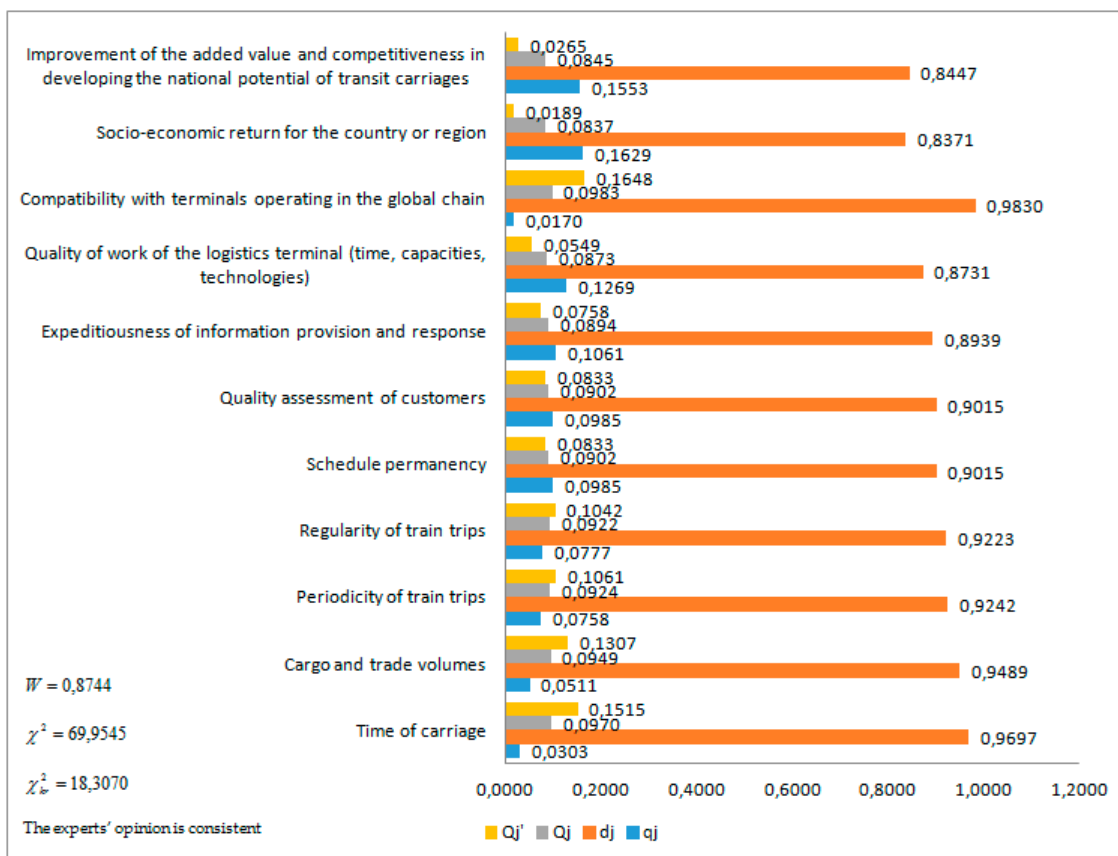
Figure 3. Data of ranking evaluations.

Figure 3 provides all the factors and their arrangement order, from the most to the least important ones.

The results of the research of the internationalization processes model allows stating that in pursuit of ensuring successful operation of the "alliance + cluster" system in internationalization processes of railways, the following sequence should be followed:

1. Compatibility with terminals operating in the global chain;
2. Time of carriage;
3. Cargo and trade volumes;
4. Periodicity of train trips;
5. Regularity of train trips;
6. Schedule permanency;
7. Quality assessment of customers;
8. Expeditiousness of information provision and response;
9. Quality of work of the logistics terminal (time, capacities, technologies);
10. Improvement of the added value and competitiveness in developing the national potential of transit carriages; and
11. Socio-economic return for the country or region.

Results of the expert survey allow stating that the offered internationalization model for the development of activities in foreign markets is suitable for the development of activities of railways. However, seeking to ensure successful implementation of this model, the following sequence of actions should be observed:

1. Dissemination of knowledge;
2. Activity inside the network;
3. Identification of common problems and methods for solving them;
4. Global space; and
5. Publicity of the trademark.

Based on expert evaluations and calculations made, the strategic alternative of railway transport using the "alliance + cluster" system model should be implemented in the following priority order:

- To foster institutional reforms in pursuit of a more efficient integration of the railway transport sector into business processes by changing the management concept and principles;
- To foster transit carriages by giving priority to complex development of transport technologies and carriage services with an aim to expand the range of transit services;
- To improve cooperation between the private and the public sectors in a targeted way by improving the management of internationalization processes in the railway development process;
- To emphasize the role of Lithuania as an EU border and external state for links with the Eastern market;
- To initiate a new concept of operating shuttle trains from Lithuania focusing on regularity, reliability of shuttle trains, and eliminating the likelihood of delays;
- To pursue changing the policy of intermodal carriages in Lithuania by focusing on the strengthening of the role of railway transport in long-distance freight carriages among Lithuanian and other logistics terminals globally;
- To emphasize the role of public logistics terminals set up in Lithuania for utilizing capacities of railway transport;
- To integrate into the international railway corridor network by ensuring all functions necessary for activities of the corridors; and
- To integrate Lithuanian logistics terminals into a global chain of logistics terminals, and to blend with IT systems for control and coordination of freight carriages operating in global logistics centers.

In summary of the functioning of the model, its evaluation, and research results, the following advantages of the model can be distinguished:

- This model provides for the advancement and research of transport development and planning, offering a new approach to a global business solution, which is closely related to railway transport and logistics. In particular, the "alliance + cluster" model seeks to identify the requisite activities for advancing coordinated evolution of distinct modes of transport and promoting and affecting the economy of a certain region and the national economy as well.
- This model brings all stakeholders together to establish a new cooperative unit to expand international cooperation and interconnection possibilities under the concept of multilevel governance, which is sustainable in macro-regional level with established alliance and cluster organizational forms. The model is based on the following pillars: Integrated infrastructure, integrated planning, integrated management, and coordinated investments.

4. Conclusions

A lack of scientific knowledge and scientific research justifying the application of new organizational forms for the development of railway transport activities within the international cooperation context was identified.

There is a lack of different innovative organizational forms, new business organization forms, and new cooperation development methods, which is especially relevant for railway transport activities nationally and internationally.

To manage internationalization processes in both international and national markets, creating an efficient "alliance +cluster" system capable of combining parts or elements of railway transport and other associated services into a single whole is necessary.

Taking into consideration theoretical generalizations, a model for the management of internationalization process of railway transport development based on the functioning of the "alliance + cluster" system was drawn up.

Based on the proposed methodology, a model based on the example of Lithuanian Railways was approved, and possibilities of a railway transport undertaking to integrate into the international market and to carry out the development of international activities were identified.

Having adapted the model, railway transport would become competitive in the international environment and would provide more efficient services. This way, a synergetic effect between railway transport and other interested service providers would be ensured simultaneously, providing related services.

The developed model could be used as a basis for ensuring a prospective direction for further economic research by developing research works and practical activities for strengthening the role of the Lithuanian railway transport and logistics sectors within the context of enhancing competitiveness and economic value of the Baltic region by attracting investment.

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