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DATA-DRIVEN APPROACH TO EVALUATION OF TRANSPORTATION DEVELOPMENT

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ПОДХОД К ОЦЕНКЕ РАЗВИТИЯ ТРАНСПОРТИРОВКИ, ОСНОВАННЫЙ НА УПРАВЛЕНИИ ДАННЫМИ

Abstract: The most important goal of logistics is to achieve maximum profit by considering only the direct costs of the company and at the same time ensuring customer expectations. One of the key components of a logistics system is transportation. The development of transportation requires strategic planning and evaluation. The article presents data-driven evaluation of transportation development based on one case of logistics company operating in Lithuania. In order to carry out the evaluation the set of criteria are distinguished, and the results of evaluation are presented. The results of the study show that there is: 1) a strong relationship between the GDP indicator both in Lithuania and Poland and the number of cargoes transported by the company; 2) an average relationship between the volume of construction in Lithuania (in Poland) and the number of cargoes transported by the company as well; and very similar relationship between the number of Lithuanian (Polish) transit and the number of cargoes transported by the company.
Keywords: data-driven evaluation, development of transportation, logistics, decision making.

Аннотация. Наиболее важной целью логистики является достижение максимальной прибыли, учитывая только прямые затраты компании и в то же время обеспечивая ожидания клиентов. Одним из ключевых компонентов логистической системы является транспорт. Развитие транспорта требует стратегического планирования и оценки. В статье представлена оценка развития транспорта на основе данных, основанная на одном примере логистической компании, работающей в Литве. Для проведения оценки выделен набор критериев и представлены результаты оценки. Результаты исследования показывают, что: 1) существует тесная взаимосвязь между показателем ВВП в Литве и

Польше и количеством грузов, перевозимых компанией; 2) средняя зависимость между объемом строительства в Литве (в Польше) и количеством грузов, перевозимых компанией; 3) очень похожая взаимосвязь между количеством литовских (польских) транзитных грузов и количеством грузов, перевозимых компанией.
Ключевые слова: оценка на основе данных, развитие транспорта, логистика, принятие решений.

In times of globalization, logistics companies are not only opening new opportunities but also facing new challenges. As markets expand, orders flow increases, so the business needs to make the right logistical decisions to operate effectively in a global environment: anticipate development alternatives, increase customer satisfaction, and more. The goal of logistics is to ensure the delivery of the necessary products to the company at the right place, at the right time, at a reasonable price [12]. However, both demand and supply for this service are high today. The field of logistics in Lithuania is well developed, therefore competition is inevitable.

Logistics companies strive to remain competitive in the market, and are constantly evolving, seeking new development opportunities, and seeking to keep up with technological innovation. One of the most effective solutions for successful development is strategic and data-driven decision-making based on the evaluation of logistics company processes. The relevance of this topic is also revealed by the abundance of scientific articles on logistics processes in the last twenty years [1], [12], [6], [4], [10], [5]. Properties and factors of logistics processes are analysed by [2], [4], [9].

The logistics system can be described as a process of planning and coordinating all activities, which includes movement of material flows and minimizes overheads to ensure the desired level of customer service [11]. It is the systemic approach that is used to investigate the logistics system, since the development of a common management system requires its elements to be viewed as interrelated and interacting. The main feature of the system approach is the encouragement to improve the whole logistic system rather than individual functional elements [5]. A properly organized logistics system allows a trading or brokerage firm to coordinate the trading process, considering the characteristics of all its stages and operations. A company can significantly reduce its costs and increase operational efficiency through logistics processes [8].

Structural analysis of logistics processes can be described as follows [3], [6], [7]:

1. Transportation Process is a logistics process that includes product movement management, mode of transport selection, vehicle selection, routing, carrier selection, and compliance with local and international transport laws.
2. Order Placement Process is the logistics process that drives the product distribution process to meet customer needs and requirements.
3. Customer Service Policy Process is the logistics process that encourages finding a way to improve customer service with the least cost.
4. Product Production and Handling Process involves the selection of raw

materials, ordering, delivery, handling and the complete process flow.

5. Inventory Management Process involves inventory control. It is necessary to ensure the supply of necessary products according to the needs of consumers.
6. Optimal use of transport warehouses involves specific conditions that warehouses, and vehicles must meet, as well as grouping, stockpiling, matching of consignments and vehicle filling.
7. Cargo Handling Process is the management of cargo unloading and loading, where it is very important to choose the right equipment that helps to make the best use of the vehicles.
8. Process of managing non-standard cases such as accidents seeks to minimize adverse effects and losses, which requires the prior identification of routes, vehicles and warehouses.

The study presents a quantitative approach that analyses and interprets company transport statistics covering the period of four years (2015–2018). The data were collected from the "UAB Baltic Transline" Central and Eastern Europe division, which main area of responsibility is cargo transportation (i.e. road transportation). The analysis presented in the paper consists of identifying the relationship strengths of the criteria identified in the qualitative study. The latter study revealed the main factors causing the development of transportation.

Results show that the most important criteria for transportation development come from the category of the economic environment, which are a gross domestic product (GPD), volumes of transit and volumes of constructions. Therefore, using correlation and simple linear regression analysis the 6 relationships were analysed, namely:

1.1 Relationship between number of cargoes and GDP in Lithuania;

1.2 Relationship between number of cargoes and DGP in Poland;

1.3 Relationship between number of cargoes and volume of constructions in Lithuania;

1.4 Relationship between number of cargoes and volume of constructions in Poland;

1.5 Relationship between number of cargoes and volume of transit in Lithuania;

1.6 Relationship between number of cargoes and volume of transit in Poland.

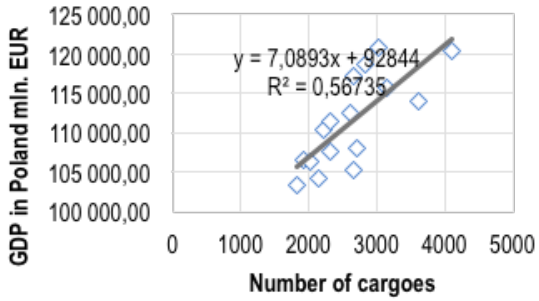


Figure 1 – Relationship between number of cargoes and GDP in Lithuania

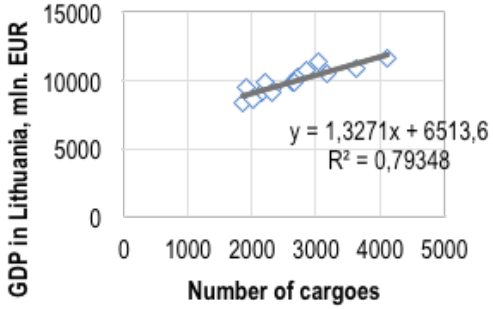


Figure 2 – Relationship between number of cargoes and GDP in Poland

Based on the obtained data (Figures 1 and 2, Table 1), it can be concluded that there is a strong relationship between the GDP indicator both in Lithuania and Poland and the number of cargoes transported by the company.

Figures 3 and 4 show that there is an average relationship between the volume of construction in Lithuania (in Poland) and the number of cargoes transported by the company as well.

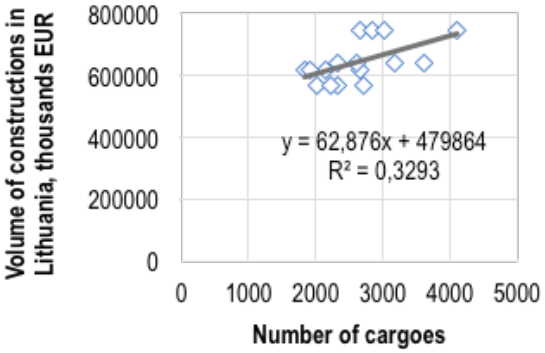


Figure 3 – Relationship between number of cargoes and Volume of constructions in Lithuania

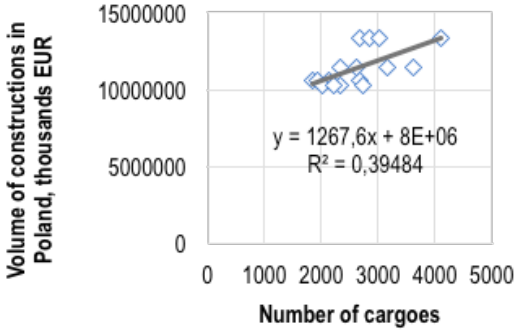


Figure 4 – Relationship between number of cargoes and Volume of constructions in Poland

Figures 5 and 6 reveals very similar relationship between the number of Lithuanian (Polish) transit and the number of cargoes transported by the company.

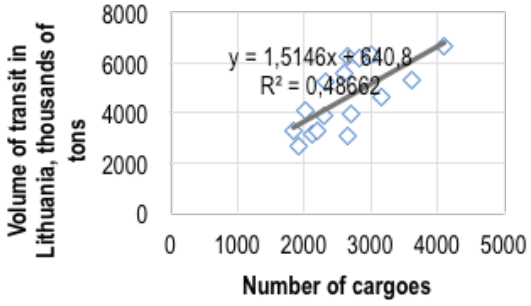


Figure 5 – Relationship between number of cargoes and Volume of transit in Lithuania

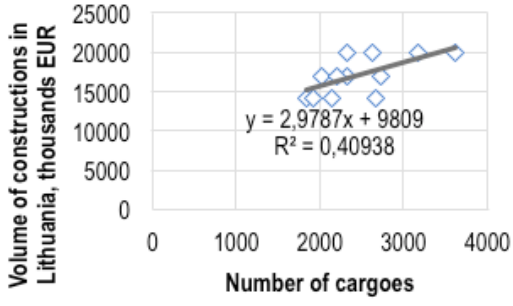


Figure 6 – Relationship between number of cargoes and Volume of constructions in Poland

In all analysed cases, the regression model is statistically significant. So we can state the trends following which the strategy of the transportation development could be taken for consideration.

Analysing the previously defined linear relationships, it can be stated that there is a relationship between the number of transported cargoes and the GDP indicators of the countries, construction volume indicators and transit number indicators.

Table 1 – Metrics of Simple Linear Regression, α = 0.05

	Metrics				
#	R	R^2	p-value of ANOVA	p-value of Intercept	p-value of Coefficient
1.1	0.891	0.794	0.000	0.000	0.000
1.2	0.753	0.567	0.001	0.000	0.001
1.3	0.574	0.329	0.020	0.000	0.020
1.4	0.628	0.395	0.009	0.000	0.009
1.5	0.698	0.487	0.003	0.576	0.003
1.6	0.640	0.409	0.025	0.006	0.025

Consequently, both (quantitative and qualitative) parts of the study form the general conclusion that the number of cargoes transported by "UAB Baltic Transline" would increase, the criteria of the economic environment of international business should be as follows: as company's performance is steadily rising, the managers must strive to keep up with this trend.

However, in order to achieve higher growth, it would be expected to expand the division's activities and to find new alternatives to transportation between countries with a higher GDP, to improve transport management using the latest technologies and to expand the number of highly qualified employees.

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