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УДК 656:005.932

ПРИМЕНЕНИЕ ФАКТОРНЫХ МОДЕЛЕЙ КАК ОПТИМИЗАЦИОННЫЙ РЕСУРС УПРАВЛЕНИЯ ТРАНСПОРТНОЙ СИСТЕМОЙ: ФАКТОРНАЯ СПЕЦИФИКАЦИЯ

APPLICATION OF FACTOR MODELS AS AN OPTIMIZATION RESOURCE FOR TRANSPORT SYSTEM MANAGEMENT: FACTOR SPECIFICATION

О.А. Ходоскина, Э.И. Гордей, В.Н. Аношко

Аннотация. В статье рассмотрены значимые аспекты при отборе факторов для моделирования транспортных систем, а также влияющие ограничения, учет которых позволяет использовать математическое имитационное моделирование как реальный оптимизационный ресурс при управлении транспортными системами.

Abstract. The article considers significant aspects in the selection of factors for modeling transport systems, as well as influencing restrictions, the consideration of which allows using mathematical simulation modeling as a real optimization resource in the management of transport systems.

Ключевые слова: факторы, аспекты моделирования, спецификация модели, факторные ограничения, оптимизационный ресурс, транспортная система.

Keywords: factors, aspects of modeling, model specification, factor constraints, optimization resource, transport system.

Introduction

The functioning of transport as one of the key sectors of the economy largely depends on the correct forecasting and optimization of various parameters. Mathematical models are often used today

to solve complex optimization problems of management and planning in the field of transport. The construction of such models requires not only sufficient, but also careful selection and high-quality analysis of factors that affect the main processes in the transport sector. Therefore, in the context of the transport sector, mathematical modeling should take into account a number of industry features when structuring factors: it is important to analyze the capacity of routes, volumes of cargo and passengers, travel time, cost of transportation, the impact of weather conditions, traffic jams, seasonal fluctuations in demand, technical condition of vehicles, the degree of congestion on routes, the fare system, and geographical features of routes. The combinatorial combination of all these factors affects the final efficiency of the entire transport system and requires in-depth analysis at all stages of modeling.

Main part

When constructing a mathematical model for transport, it is necessary to take into account several specific aspects of factor selection and understand that the success of the model depends on the accuracy of the selected factors and their impact on the process under study (Figure 1).

Based on the general mandatory characteristics when selecting factors when constructing mathematical models in transport, it is advisable to consider the following aspects:

1) Identification of key variables: First of all, it is necessary to identify the main variables that affect the functioning of the transport system. These may be parameters such as traffic volume, time delays, cost of transport services, number of vehicles, and others. Identification of key variables allows you to focus on analyzing the most significant factors.

2) Accounting for dynamic changes: The transport sector is subject to constant change, and therefore it is important to take into account the dynamic nature of factor selection. This means that the model must be able to adapt to changing conditions and include the ability to update and adjust factors during operation.

3) Analysis of relationships: Factors in a transport model can be interrelated and influence each other. Therefore, it is important to analyze these relationships and assess their impact on the problem being solved. Given the complexity of transport systems, it is necessary to consider both direct and indirect relationships between factors.

4) Defining the model parameters: When selecting factors for building a mathematical model for transport, it is important to determine the parameters that are most significant for achieving the goals. This will help focus on the most important aspects and simplify the analysis and interpretation of the modeling results.

5) Taking into account the specifics of the transport industry: The transport industry has its own specific features, such as seasonality, interaction of different modes of transport, regional aspects, and others. When selecting factors for modeling, it is necessary to take these features into account and include them in the analysis to obtain more accurate results.

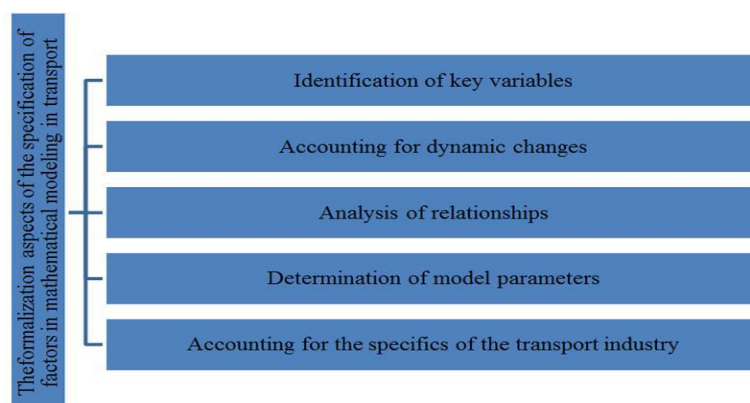


Figure 1 – The significant formalization aspects of the specification of factors in mathematical modeling in transport

To clearly represent the specifics of selecting factors and analyzing relationships in the transport industry, we can consider several examples:

1) Optimization of freight transportation routes, which assumes that when analyzing relationships in this area, it is necessary to take into account such factors as cargo weight, distance between points, road conditions, tariffs for transport services, and others. Building a mathematical model allows you to optimize freight transportation routes and, accordingly, reduce logistics costs.

2) Forecasting passenger flows in urban transport involves taking into account such factors as the city's population, tourist flow, public transport schedule, seasonal fluctuations in demand, and others. Building a mathematical model in this case allows you to forecast passenger flows and optimize the public transport schedule.

It is important to note that in transport system modeling, there are many factors that must be taken into account to achieve accurate and realistic results. Abstract mathematical structures are used in modeling that are suitable for describing and analyzing various aspects of transport systems. Taking into account the aspects discussed earlier, when building, for example, a simulation model of a transport system, you can consider a set of influencing factors that will be taken into account in the modeling:

Factor 1. Transport types: take into account the differences between types of transport (land, air, water) and their characteristics.

Factor 2. Route graphs: determining available routes, junctions, and intersections to optimize movements.

Factor 3. Cargo and passenger volumes: analyzing the amount and type of cargo and passengers transported for optimal planning.

Factor 4. Travel Time: taking into account the time required to travel from point A to point B, taking into account possible delays and traffic jams.

Factor 5. Transportation Cost: assessing the economic aspects of transportation, including tariffs, expenses and revenues.

Factor 6. Weather Conditions: taking into account the impact of weather on traffic conditions and transportation safety.

Factor 7. Traffic Jams: analyzing traffic flow problems and finding ways to solve them.

Factor 8. Seasonal Fluctuations in Demand: taking into account changes in demand for transportation services depending on the time of year or events.

Factor 9. Technical Condition of Vehicles: assessing the condition and reliability of transport vehicles to ensure safety and efficiency.

Factor 10. Route Congestion: assessing the congestion and efficiency of transport infrastructure use.

Factor 11. Fare System: analyzing different fare payment models and their impact on transport use.

Factor 12. Geographical Features of Routes: taking into account terrain features, road infrastructure and distances between points.

However, although mathematical models in transport are a powerful tool for analyzing and optimizing transport systems, they also have some disadvantages and limitations (Figure 2):

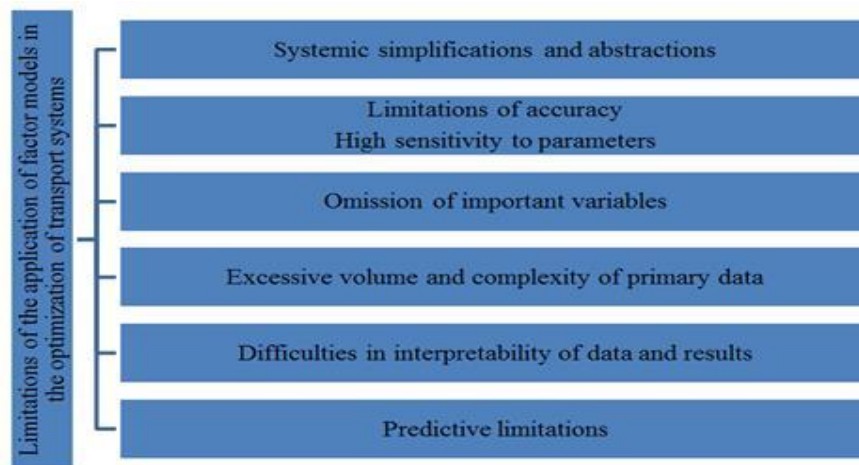


Figure 2 – The influencing factor constraints in the construction of an information and management mathematical transport model

Limitation 1. Simplifications and Abstractions: Mathematical models often use simplified assumptions and abstractions, which may distort real transport processes and situations.

Limitation 2. Accuracy Limitations: Predictions and results obtained by mathematical models may be limited in accuracy due to the complexity and unpredictability of real transport systems.

Limitation 3. Parameter Sensitivity: Models may react to changes in parameters and conditions, and even small errors in the input data can lead to significant deviations in the results.

Limitation 4. Omission of Variables: Sometimes mathematical models do not take into account all the significant variables and factors, which may lead to incomplete or distorted conclusions.

Limitation 5. Data Complexity and Volume: Building and using mathematical models in transport requires a large amount of data, which can be complex in real conditions and create difficulties in processing the information.

Limitation 6. Difficulty in interpretation: Some mathematical models can be difficult to interpret and understand, especially for people without specialized knowledge in the field of mathematics and transportation.

Limitation 7. Limited predictive capabilities: Mathematical models have their limitations in predicting long-term and complex transport trends and situations.

Despite these disadvantages, mathematical models remain a valuable tool for analyzing and managing transport systems, provided that the correct approach to their development, use and interpretation of results is taken.

Conclusion

Thus, it should be noted that the listed factors play an important role in the construction of mathematical models in transport, allowing to optimize transportation processes, increase the efficiency and rationality of the transport system. Mathematical models in transport help to make informed decisions, optimize the use of resources, improve the efficiency of transport systems and ensure their sustainable development. They are a powerful tool for analyzing, planning and managing transport activities of various scales and levels of complexity. However, the construction of mathematical models in transport requires careful selection of factors and consideration of the specifics of the industry. The correct choice of variables, analysis of relationships, determination of model parameters and consideration of the specifics of the transport industry play a key role in the successful creation of models, which is a significant optimization resource for managing the transport system.

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УДК 656.13: 504.06

ПРИМЕНЕНИЕ ИТ-ТЕХНОЛОГИЙ В ОРГАНИЗАЦИИ УТИЛИЗАЦИИ АВТОМОБИЛЕЙ

APPLICATION OF INFORMATION TECHNOLOGY IN THE ORGANIZATION OF CAR RECYCLING

Е.Г. Ишкина

***Аннотация.** Применение информационных технологий при организации утилизации автомобилей не пригодных к дальнейшей эксплуатации может быть реализовано как поиском мест приема автомобилей, так и для компонентной утилизации, передачи на рециклинг и продажи годных к дальнейшей эксплуатации компонентов. Использование информационно-поисковых систем в совокупности с информацией, полученной от диагностических систем автомобиля позволит повысить коэффициенты использования или переработки компонентов. Рассмотрен зарубежный*