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Abstract of the doctoral thesis:

„A model of shaping and implementing car-sharing system

based on multi-criteria decision making"

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The increase of the interest in the implementing car-sharing services in the urban transport systems as an alternative to classic forms of mobility is currently being observed. Therefore, there is a decision problem regarding selecting the appropriate type of system for the selected location.

The dissertation is based on an original, universal and comprehensive concept of a model for shaping and implementing car-sharing services fitted to a given urban area and stakeholders' needs. The proposed method is based on using aspects of mathematical modeling of transport systems and multi-criteria decision support methods.

The developed model is based on a 7-step procedure algorithm including:

•   performing a multi-faceted analysis of the decision-making environment with the creation of an identification model for car-sharing services,

•   structuring of the decision problem,

•   determining the method of identifying decision variants, establishing the criteria for assessing decision variants,

•   selection of appropriate methods of multi-criteria decision support,

•   performing computational experiments with the analysis of the results and evaluation of the model functioning.

The proposed algorithm is a user manual to shape own car-sharing system to be implemented in a given area.

The model presented in the dissertation was applied and verified in the area of the Górnośląsko-Zaglębiowska Metropolia (GZM). Six variants of the implementation of car-sharing services were proposed, which were assessed from the point of view of a set of 6 main criteria and 23 sub-criteria, in the process of modeling the preferences of 4 groups of stakeholders. Computational experiments were performed using three multi-criteria decision support methods, i.e., AHP, ELECTRE III and TOPSIS. As a result of the computational experiments, the final rankings of the car-sharing scenarios were obtained, ranked from the best to the worst, from each stakeholder's point of view. To verify the stability of the developed final rankings to the changes in the weights of the criteria, a sensitivity analysis of the results was performed. The study consisted of performing computational simulations taking into account modified criteria weights from -50% to 50%.

The final result of the analyzes was the development of recommendations for the implementation of car-sharing services in the Górnośląsko-Zagłębiowska Metropolia. The obtained results indicate the correctness of the developed model and the possibility of using selected multi-criteria decision support methods during the process of shaping and implementing the car-sharing system in real conditions.