A new method to support risk management in multi-criteria decision-making problems

Research project objectives and hypotheses

The project aims to create an innovative risk management method for solving complex decision problems by evaluating risk in a more detailed and personalized way. Traditional methods often simplify risk by treating it as a single factor, but this project seeks to assess the risk of choosing specific options while considering how different decision factors interact. Using the prospect theory value function, which captures how people perceive gains, losses, and risks differently, the method will incorporate customized risk indicators for each decision factor. By combining this function with criteria relevance tailored to individual decision variants, the approach provides a more dynamic and context-sensitive analysis. This evaluates the appeal of different options and sheds light on the risks involved, offering a clearer and more comprehensive guide for decision-making under uncertainty.

A key question driving this research is: How can applying the prospect theory value function to evaluate individual criteria improve our understanding of risks and support more reliable and precise decision-making?

The main goals of the study are:

- Development of a method for determining the risk assessment of decision variants selection
- Analysis of the impact of changes in the parameters of the prospect theory value function on the risk assessment of alternatives selection
- Identification of local criteria weights representing changing risks in the evaluation
- Empirical verification of the proposed approach in multi-criteria problems
- Development of a universal decision support model for multi-criteria problems that includes the risk assessment of alternative selection

Main hypothesis: The application of the prospect theory value function to determine risk indicators based on the decision matrix will provide additional insights into decision alternatives within multi-criteria decision analysis, including the level of risk associated with their selection.

Expected impact of the proposed project

The proposed project is expected to significantly advance risk management by introducing a method that aligns risk evaluation with the preferences and risk tolerance of decision-makers. By expanding the traditional use of decision matrices to include the assessment of risks across multiple criteria, the project provides a more dynamic and realistic framework for addressing complex decision problems. This approach captures the variability and asymmetry in risk perception, enabling tailored and context-sensitive analyses. The use of custom risk weights for each decision variant ensures that decisions are better aligned with real-world complexities and individual priorities.

The anticipated impact includes improved decision-making tools for fields such as logistics, project management, and investments, where managing uncertainty is critical. By offering a more comprehensive analysis that evaluates both the attractiveness and risks of alternatives, the project contributes to the evolution of multi-criteria decision analysis techniques. The results are expected to provide practical, user-centered tools that empower decision-makers to navigate uncertainty with greater precision, adaptability, and confidence.