

Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Systems Engineering



Bachelor Thesis

Multi-criteria decision making at an enterprise

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Abstract

The bachelor's thesis is devoted to the application of various methods in multi-criteria analysis.

In the theoretical part, the concepts of multi-criteria analysis, methods for determining the weights of criteria and methods for determining alternatives are disclosed. Three methods (SAW, TOPSIS, and AHP) are described in more detail. In the practical part, the problem of a specific company is considered and ways to solve it are described, based on the methods that were previously presented in the theoretical part. Problem, choosing a service provider from a variety of offers. The result obtained, the best supplier of the company is determined.

Keywords: multi-criteria analysis, criteria, service provider.

Objectives

The main objective of the bachelor's diploma paper is to select the necessary methods and ways for multi-criteria analysis and use them to support adopting the best solution to the real problem.

Partial objectives:

- Description of the situation, collection of real data, determination of the problem and the order of its solution using the selected methods, making the best decision;
- Theoretical research will describe the selected methods and serve as the basis for constructing a mathematical model.

Methodology

The bachelor's thesis is devoted to multi-criteria decision-making problems.

The paper consists of two main parts.

The first part is based on the study and analysis of the literature.

This part describes the concepts of the multi-criteria analysis, the principle of the sequential reduction of uncertainties, and more fully explains the methods used in MCDA:

- Criteria weights determination methods:
 - Sequence method;
 - Scoring method;
 - Saaty method.
- Multi-criteria selection methods:
 - Methods based on quantitative measurements: SAW-method, TOPSIS-method;

- Methods based on qualitative measurements, the results of which are transferred into a quantitative form: Analytical Hierarchy Process (AHP).

The second part of the paper is the selection of methods for multi-criteria analysis and the application of the selected methods in the practical solution of the problem set.

All calculations are based on data taken from the real coal industry enterprise.

Results and discussions.

A multi-criteria analysis of the choice of service providers was carried out using the principle of sequential reduction of uncertainty with 1 method for determining criteria weights (Saaty method) and 3 methods for evaluating alternatives (TOPSIS-method, SAW-method, AHP-method).

Based on the results of the analysis, the most optimal service provider for the company was determined – “Soyuz” LLP, the second (backup) by preference was “Limma” LLP.

Before starting the analysis, it was clear that Alternative No. 1 and Alternative No. 2 were not dominant in almost all the given criteria. But it was an integrated approach, using three different assessment methods that made it possible to identify the most technically prepared suppliers that meet the requirements of the company both in reliability and price. Using only one method in the analysis could give a result that did not meet all the stated requirements.

For example, during the analysis by the TOPSIS method, the Alternative No. 5 with low scores on most criteria was at the second place in the ranking.

However, this was not enough in the complex, as further calculations showed.

Conclusion.

The collected materials and the calculations made in this diploma paper showed that multicriteria decision-making analysis using the principle of successive reduction of uncertainty, including three methods for evaluating alternatives (TOPSIS Method, SAW Method, AHP Method) can be an effective tool in supporting decision-making by coal enterprises industry when choosing service providers.

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