

An Integrated Approach of Multiple Correspondences Analysis (MCA) and Fuzzy AHP Method for Occupational Health and Safety Performance Evaluation in the Land Cargo Transportation

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Abstract

Land cargo transportation is one of the components of the logistics chain with high impact on economic and social development worldwide. However, problems such as top logistics costs, deficiencies in transportation infrastructure and the failure to adopt good operating practices in aspects such as quality, environment, and occupational safety and health affect the ability of companies to comply with the agreements, requirements, and regulations of the clients and other interested parties. One of the most relevant problems for the sector is associated with the high accident rates that make this medium less advantageous compared to other means of transport with impact on operational costs, on logistics indicators, on compliance with legal regulations and customer satisfaction. However, although there are legal standards and management standards in occupational safety and health, evaluating performance can become a difficult and subjective process, due to the complexity of the land cargo transportation and the different interest groups involved. Besides, there is little information in the literature that provides solutions for the industry. Therefore, this document presents an integrated approach between multi-criterion decision making models (MCDM) and the Multiple Correspondences Analysis (MCA) to facilitate the evaluation and improvement of occupational health and safety performance, with a logical process, objective, robust and using both qualitative and quantitative techniques, with real application in the land cargo transportation sector. First, the multivariate method of Multiple Correspondences Analysis (MCA) was used for the evaluation of a sample of companies in the industry, considering the factors and sub-factors identified in the first stage and performing correlational analyzes among the variables. Subsequently, a multicriteria decision-making model was designed to determine the factors and sub-factors that affect occupational health and safety performance through the technique of the Fuzzy Analytic Hierarchy Process (FAHP). Finally, improvement strategies are proposed based on the approaches suggested in this document.

Keywords

Fuzzy analytical hierarchy process, Fuzzy AHP, Multicriteria decision making, MCMD, Factorial analysis, Multiple correspondence analysis (MCA), Occupational health and safety, ISO 45001, Land cargo transportation, Cargo logistics, Performance evaluation.