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A Supplier Risk Assessment Model based on Hesitant Fuzzy Linguistic Term Sets with Possibility Distributions: An Application to a Humanitarian Supply Chain

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Introdução

The assessment of supplier risk has received greater attention in recent years as a way to guarantee the continuity of operations and the desired performance level. The literature has approached it as a group decision-making process in which the involved specialists award scores to the suppliers under evaluation, considering multiple risk factors (or criteria).

Problema de Pesquisa e Objetivo

Within this context, the hesitation of the specialist can occur due to the fact that judgments are based on imprecise or uncertain information. However, no supplier risk assessment model was identified, which is appropriate for group decision-making processes under hesitation. Given this, the objective of this study is to propose a decision-making model based on Possibility Distribution Hesitant Fuzzy Linguistic Term Set combined with TOPSIS (PDHFLTS-TOPSIS).

Fundamentação Teórica

The evaluation of risk provides the conditions necessary to classify and mitigate identified risks. Supplier risk assessment is of substantial importance to humanitarian supply chain management. Considering that humanitarian aid supply chains function within an uncertain regime due to the unpredictability of catastrophes or adverse events, organizations need to be agile to respond appropriately to the risks from disasters. Within this scenario, the supplier risk assessment becomes crucial to an appropriate response.

Metodologia

This work is characterized as a normative axiomatic study. Given the proposed objective, the following steps were adopted: bibliographic research, modeling, application, and analysis of the results. MS Excel was used to implement two computational models based on the PDHFLTS-TOPSIS method (Wu et al., 2019). The pilot application was conducted in a public civil defense organization, part of a humanitarian supply chain.

Análise dos Resultados

The model makes the segmentation of suppliers possible based on criteria related to risk-intensifying factors and risk-reducing factors. The criteria related to import instability (C2) and delivery time (C4) received greater weight, while suppliers A3 and A4 were classified as low risk. The specialists believed that the obtained classification was consistent.

Conclusão

The model can help companies segment their suppliers based on supplier risk factors, supporting the implementation of risk mitigation strategies. The distributions of possibilities associated with decision-maker judgments prevent loss of information and are a more effective approach for modeling uncertainty and hesitation. The information provided by the model can inform the elaboration of supplier development actions, which seek the continuous improvement of suppliers and the reduction of supply risks.

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