

A Comparative Study of Multi-Criteria Decision-Making Models Performance Under Linguistic Variable for Customer Prioritization in A Plastic Company

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Abstract. The objective of this research is to develop a Multi-Criteria Decision Making (MCDM) model for customer prioritization in a plastic company. This research focus on a multiple criteria decision-making problem under linguistic variables. Due to uncertainty and vagueness of linguistic information, three MCDM methods are employed, namely Fuzzy Analysis Hierarchy Process (FAHP), Fuzzy Technique for order preference by similarity to an ideal solution (Fuzzy TOPSIS) and 2-Tuple linguistics representative model. Firstly, FAHP focuses on a hierarchy process and pairwise comparison. Secondly, Fuzzy TOPSIS compares the values between the positive and negative ideal points. Lastly, 2-tuple linguistics assessment by transforming linguistic values into the 2-tuple spaces that can deal with loss of information. The result of performance comparison analysis shows that the ranking of 3 customer is the same when using FAHP and Fuzzy TOSISS due to loss some information after defuzzification processes while the 2-tuple model is flexible to handle the uncertain and overcome the loss of information and can ranking be Customer 3 > Customer 1 > Customer2 with the assumption equal weighted criteria. For validity testing, this research also performs the sensitivity analysis of each criteria, the ranking can be changed in case of the weighted of 2 criteria changed. If the company focuses on %expected profit, the ranking should be changed to Customer 1 > Customer 3 > Customer2. But if the company emphasizes on the competitors, the result will be same.

Keywords: MCDM, Fuzzy AHP, Fuzzy TOPSIS, 2-Tuple model, Linguistic information