

Supplier selection by using AHP and TOPSIS techniques and an application in a Turkish textile company

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Abstract:

One of the alternative investment strategies of large-sized enterprises is to improve the supplier's processes. Selecting the right suppliers will decrease company's purchasing cost, increase customer satisfaction and improve the competition capacity. Supplier selection is a complex multi-criteria problem which includes both qualitative and quantitative criteria. In order to select the suppliers, it is necessary to make a tradeoff between these criteria some of which may conflict. Different approaches are suggested to solve the supplier selection problem in the literature. The main purpose of this study is to solve the supplier selection problem of the textile firm by using AHP and TOPSIS. Quality, cost, delivery and service criteria that are mostly used in literature are defined as main criteria in the paper, and also their sub-criteria are defined. AHP method is used to determine the importance degree of main criteria and sub-criteria, TOPSIS method is developed to rank the suppliers. Supplier selection is one of the key activities of purchase management in supply chain. Supplier selection is a multifaceted problem relating qualitative and quantitative multi-criteria. This paper deals with a supplier selection problem in an Indian automobile company. The work presents selection of headlamp supplier using integrated fuzzy multi-criteria decision-making approaches: analytical hierarchy process (AHP) and technique for order of preference by similarity to ideal solution (TOPSIS). The selection process starts with identifying the criteria based on literature review and interviewing industry experts. Weights to criteria are assigned using AHP, and suppliers are ranked using AHP and TOPSIS. Consistency tests are carried out to check the quality of expert's inputs. Also, sensitivity analysis is done to check the robustness of the approach. The results address that fuzzy approaches could be effective and more accurate than the existing approaches for supplier selection problems. After businesses realized the direct and indirect effect of suppliers on product quality, time-to-market, company's reputation; therefore, on their profit, purchasing function and supplier relationship management flourished in practice as well as in research. To manage purchasing

function, gain competitive advantage, and enhance performance, supplier selection (SS) process should have appropriate methods and criteria for evaluating suppliers. The involvement of multi-criteria, several alternatives and decision-makers with different perspectives complicates the SS process. Therefore, this study proposes an extended use of the well-known TOPSIS method for solving a group decision-making problem under intuitionistic fuzzy (IF) environment in which all decision-makers' ideas are presented as IF values. The paper also aims to use IF numbers to explain the importance of alternatives and the weights of criteria. The application part of the paper focuses on selecting the best raw material supplier for a specific Turkish textile company by using ranking function.