Vendor selection by application of revised weighting method and fuzzy multicriteria linear programming

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The problem of vendor selection and determination of material quantities supplied is the key element in the purchasing process in manufacturing which is one of the most important activities in supply chain. If all the selected vendors are able to meet perfectly the buyer's requirements, then the selection process becomes easier and is based only on the selection of the most suitable vendor in terms of purchasing costs, product quality and vendor reliability. Nevertheless, practice shows that it is not good to rely on one vendor only. Therefore the management of the purchasing company generally enters into contracts with several vendors. Their number usually ranges from two to five for each sort of material. Also, there are cases when no vendor can meet the buyer's demand, or will not do it in order to protect his own business interests.

Vendor selection in supply chain is a multi-criteria problem that involves a number of quantitative and qualitative factors. This work deals with a concrete problem of flour purchase by a company that manufactures bakery products. The criteria for vendor selection and quantities supplied by individual vendors are: purchase costs, product quality and reliability of vendors. Each of these criteria is expressed through a number of sub-criteria, which can further be expressed through a number of sub-sub-criteria, etc. This reveals the hierarchical structure of criteria for vendor selection. The problem of vendor selection is solved by a model that combines revised weighting method and fuzzy linear programming. The study points to the advantages of using the combination of the two methods in comparison to the use of revised weighting method in combination with linear programming.

The aims of this work are the following: (1) to point on the concrete example that vendor selection is a multi-criteria problem, (2) to propose criteria for vendor selection, (3) to propose the model for vendor selection and determination of supply quotas by using revised weighting method and fuzzy linear programming, and (4) to point to the advantages of the proposed model in comparison to the usual methods of vendor selection. The concrete example will be the problem of flour vendor selection by a bakery.

We will first present the methodology of vendor selection and determination of supply quotas by use of revised weighting method and fuzzy linear programming. Then we will propose the methodology tested on the concrete example of vendor selection by a bakery. Finally, we will carry out sensitivity analysis of the obtained solutions. In the conclusion we will point to the advantages of using the proposed methodology in comparison to the use of combination of revised weighting method and linear programming.

Keywords: revised weighting method, fuzzy linear programming, vendor selection