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A fuzzy goal programming approach for green supply chain optimisation under activity-based costing and performance evaluation with a value-chain structure

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Abstract

Supply chain operation with sustainable consideration has become an increasingly important issue in recent years. However, the decision framework with integrated costing and performance evaluation for green supply chain (GSC) has not been well developed so far in the literature. For this reason, this paper is aimed to propose a fuzzy goal programming (FGP) approach that integrates activity-based costing (ABC) and performance evaluation in a value-chain structure for optimal GSC supplier selection and flow allocation. The FGP approach is particularly suitable for such a decision model which includes flexible goals, financial and non-financial measures, quantitative and qualitative methods, multi-layer structure, multiple criteria, multiple objectives, and multiple strategies. An activity-based example of structural GSC with

relevant costs and performances is presented for computing the composite performance indices of the GSC suppliers. A green supply chain of a mobile phone is used as an illustrative case. Several objective structures and their results are compared. The sensitivity analyses show that pure maximisation of financial profit can achieve the highest profit level, which also has the largest Euclidean distance to the multiple aspiration goals. In order to determine the final objective structure, an analytic hierarchy process (AHP) is used. This paper provides a new approach to assess and control a complex GSC based on value-chain activities, and obtain a more precise solution. The establishment of this GSC model not only helps decision-makers to monitor GSC comprehensive performance but also can facilitate further improvement and development of GSC management.

Keywords:

activity-based costing (ABC) | optimisation | green supply chain (GSC) | performance evaluation | fuzzy goal programming (FGP) | value-chain structure

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