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Abstract

Title	Study on Multi-objective Optimization Model for Inventory Control and Supplier Selection Problem under Uncertainty

(800 words)

Most companies are now facing dynamic challenges that require not only well-planning capacity, but also robust supply chain networks (SCN) that allow the members involved to address and respond any changes in a short notice. In particular, when inventory is stuck in the various stages of the supply chain, the company may be forced to operate at critical cash flow levels. On the other hand, among the various activities involved in SCN, purchasing is one of the most strategic functions because it provides opportunities to reduce costs across the entire supply chain. An essential task within the purchasing function is supplier selection. This comes from the fact that the cost of raw materials and component parts represents the largest percentage of the total product cost in most industries. From this point of view, this thesis addresses issues associated with inventory and supplier selection problem. We study both issues under uncertain environment and consider such problem using either stochastic approach or fuzzy approach.

At the first part, we studies multi-objective problem of periodic review inventory in two-echelon supply chain system under uncertainty in demand and lead time. We propose different strategies to solve the stock-out problem in serial replenishment system which requires a higher level of coordination. While stochastic approach is utilized to tackle the uncertainty, the multi-objective Differential Evolution (DE) is applied after giving its new algorithm to work with the problem. We reveal that the coordination strategy becomes more effective as the uncertainty increases in the system. Though retailers are required to keep a bit high inventory level to maintain a high responsiveness, this stock level is more effective to reduce the loss rate of supply chain.

At the second part, we studied multi-objective supplier selection by considering both qualitative and quantitative criteria. The fuzzy approach is applied due to the fact that most information required to assess supplier is not always available and/or usually not known precisely over the planning horizon. Concerning such characteristics, this research develops an integrated methodology of fuzzy multi-objective linear programming model for supplier selection. To improve the methodological process of deriving optimal solution, the enhanced two-phase fuzzy programming model has been proposed in this study. Through numerical experiment, we show some advantages of our proposed approach over the existing methods in providing a set of potential feasible solutions which guide DMs to select the best solution according to their preference.

At last part, we present multi-objective possiblistic mixed integer programming (MOPMIP) model of periodic review inventory problem in multi-manufacturer multi-retailer SCN. We attempt to develop a multi-objective model in a mixed imprecise and/or uncertain environment by incorporating the fuzziness of demand, lead time and cost parameters. A solution procedure is developed using the Torabi and Hassini method to solve the model and to provide a systematic framework that facilitates the fuzzy decision-making process while enabling the DM to adjust the decision and obtaining a more preferred satisfactory solution. The proposed solution procedures obtain a promising result which produces more balanced feasible solutions and provide decision support to identify critical objective in both decentralized and centralized SCN.

Moreover, as a supplementary consideration, we consider daily planning for three echelon SCN considering inventory conditions. To cope with the problem, we applid a practical hybrid meta-heuristic method that supports decision making at a tactical and operational level. Its solution procedure is developed by means of two modified heuristic methods known as the saving method and tabu search together with the graph algorithm of minimum cost flow problem. Finally, to enhance usability of the method, visualization of result is also realized by virtue of Google map API. Numerical experiments are carried out to validate effectiveness of the proposed approach.