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論　文　要　旨（博士）

論文題目	Optimizing material ordering and inventory level of two-echelon supply chain system

（要旨　800 語程度）

To compete successfully in today's market place, companies need to manage effectively and efficiently the activities of supplying, manufacturing and distributing their products and services to their customer at the right time and right quantity. With this point of view, we have studied the material ordering and inventory control of two-echelon supply chain systems that focus on the relationship between the manufacturers and the retailers based on two major points, which are coordination mechanism and emergency order.

Base on coordination mechanism, we examine the problem of how to establish an incentive scheme to furnish reliable and truthful information in supply chain. However, in the real world businesses neither a manufacturer nor a retailer can control the entire supply chain. Each supply chain member has its own state of information and decisions that are available to optimize its own interest. When the supply chain members are supposed to be separated and independent economic entities, they will act independently and try hardly to optimize their individual benefits. In this case, an action plan has to be complemented with some incentive schemes that can allocate the benefits of coordination among the supply chain members, or in the other words, can improve the overall performance of the chain as well as each member in the chain. The incentive schemes studied in this research consist of one-sided and two-sided incentives. One-sided incentive is the incentive that offered by only one party in the chain, which are the manufacturer's incentive and the retailer's incentive. Two-sided incentives are the situation when both parties intend to improve the performance of the chain by exchanging the incentives with each other. Manufacturer's incentive consists of all units' quantity discount and exceed units' quantity discount while bonus is the incentive of the retailer. The performance of these proposed incentives are evaluated based on the performance of the supply chain systems under decentralized and centralized policies. The results show that the centralized control outperforms the decentralized control regarding the profit of the supply chain system, but it fails to improve the profit of each member in the chain. However, the coordination policy with incentives can improve the overall channel profitability as well as the profitability of all members, and generate a win-win situation.

One of the disadvantages of the periodic review is that the stock out is normally occurred before receiving a new replenishment due to demand and lead-time variations in the supply chain system. Therefore, base on the second consideration point of this research, we focus on the inventory systems with two supply modes that consist of both regular and emergency modes. A regular supply mode is used periodically for stock replenishment. In contrast, an emergency mode is used when a stock out is likely to occur or the stock reaches a reorder point. All previous researches were interested in the emergency mode in terms of the performance of a single company under the assumption that all emergency order can be satisfied without considering the productivity and performance of the supply mode. Moreover, no research

studied the system that allowed both demand and lead-time uncertainties under the periodic review policy for emergency order. Associated with such circumstance, we propose three models for acquiring the emergency order for a supply chain system that can deal with both demand and lead-time variations. The first model is called "manufacturer model", in which both regular and emergency orders are placed to the manufacturer. The second model is called "outsourcing model", in which the emergency order is placed to an outsourcing company or an external member in the chain. The last model is called "priority model". In this model, the retailer gives the first priority to make the emergency order to the manufacturer but if the manufacturer could not supply, then the order is placed to the outsourcing company. The results show that when the emergency options are available, the profitability of the supply chain is increased compared with the regular model. Then the decision support system is analyzed to investigate the appropriate condition for implementing each alternative emergency model.

Since every problem in this study is formulated as a combinatorial optimization problem with mixed-integer variables, Differential Evolution (DE), after slight modification, is applied to cope with the mixed-integer programs. Through case studies, DE has been proven to be a more appropriate method to solve the present problems compared with Genetic Algorithm (GA).