

Scientific Modeling for Two-Echelon Deteriorating Inventory System in a Supply Chain

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Abstract: Recently there is a growing interest in the supply chain management (SCM). The supply chain is referred to as the logistic network consisting of suppliers, distribution centers, and retailer outlets, as well as raw materials, work-in-process inventory and finished goods that flow between the facilities. Many researchers have gone into this field of study, and have invested much resource in improving their SCM system. The different facilities in the supply chain develop their partnership through information sharing and strategic alliances in order to achieve long-term benefits and global optimality of the system.

In the current competitive market environment, the integration of companies especially in term of developing strategies is vital to reduce the overall cost of the enterprise. This is because decision made independently by one player will not result in global optimum. Global optimality will only be realized if the perspectives of all players are considered. The study also considers the case of limited capacity. Excess stock is held in a rented warehouse (which is more expensive) whenever the storage capacity of the company warehouse is insufficient.

The objective of this study is to develop an optimal joint cost from the perspectives of both the manufacturer and the retailer. The integrated two-echelon inventory model for deteriorating items is assumed to have a constant demand rate and a limited retailer storage capacity. The scientific model describes how the integrated approach to decision making can achieve global optimality as compared to independent decision by the manufacturer and the retailer. A computer code is developed to derive the optimal solution. Numerical examples and sensitivity analyzes are given to validate the results of the inventory model.

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