Coordination issues in vendor managed inventory systems

Mahesh Nagarajan
Marshall School of Business
University of Southern California
Los Angeles, CA 90089
E-mail: nmahesh@usc.edu

S. Rajagopalan
Marshall School of Business
University of Southern California
Los Angeles, CA 90089
Tel: (213) 740-0193
Fax: (213) 740-7313
E-mail: srajagop@marshall.usc.edu

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Abstract

Supply chain coordination has received substantial attention in the operations literature in recent years. Coordination issues in supply chains arise due to several factors, an important one being the difference in the cost impact of inventory and replenishment decisions on the manufacturer and retailer. In this paper, we address this asymmetry in cost impact that can lead to sub-optimal channel performance. We consider a system where a manufacturer supplies a single product to a retailer who faces random demand. The retailer incurs a fixed cost per order, an inventory holding cost and a penalty when there is a stock out (demand is back-ordered). Further, the manufacturer incurs a penalty when there is a stock out at the retailer and a fixed replenishment cost per retailer order. We assume that the players are rational and act non-cooperatively. In traditional retailer-managed inventory systems, the retailer places orders and makes replenishment decisions and the differential impact of these decisions on the costs of the retailer and manufacturer can lead to sub-optimal channel performance. We propose alternative systems based on the emerging trend towards vendor-managed inventory systems, wherein the vendor or manufacturer makes inventory and replenishment decisions. The retailer proposes a contract to the manufacturer that influences the manufacturer’s replenishment decisions and thus improves system performance. We consider a system where the decision-maker reviews inventory continuously and follows a $(Q,r)$ policy as well as one where inventory is reviewed periodically using a $(Q,T)$ policy. Other than showing that some simple contracts in a vendor-managed framework can improve system performance under certain conditions, we also propose and analyze contracts that can coordinate the channel and are first-best.

(Key words: V.M.I.; Continuous Review; Periodic Review; Rent; Channel Coordination.)