



New Inventory Control Tactics in The Context of Supply Chain Management

By Dr Georgia Skintzi, Research Fellow at MSL

Inventory theory has been an influential research topic since the seminal works of Arrow et al. (1951) and Dvoretzky (1952). During the last two decades, inventory theory and specifically inventory control have found a fertile ground to develop in the context of supply chain management. Traditionally, inventory has been employed to cope with demand uncertainty and fluctuations. Technology advancements and the shift of the organizational perspective towards more cooperative business models across the supply chain, provided firms with the required tools and the appropriate framework to improve their performance through information sharing and upstream managed inventories. Therefore, companies in their attempt to cope with increased competition and more sophisticated customers in highly volatile markets have explored new inventory control tactics. Empirical results indicate that in certain industries there has been a significant alteration in the perspective and the way inventory is managed. In contrast with traditional supply chains where the downstream node makes stock level decisions and controls inventory there has been a tendency in supply chain management to shift inventory decisions and control to the upstream. Lee and Chu (2005) list the new innovative approaches:

Click and Mortar (CAM): it was introduced by 7dream.com of Japan to manage its retail chain stores. Customers can place and track their orders at the company's web site and then pick up the products ordered at the nearest retail store. The company holds no inventory, while the supplier is responsible to deliver products at the store. CAM has been adopted by pharmaceutical chain CVS, the electronics retailer Circuit City (Lee and Whang, 2000) and Virgin's V Shops (Jardine and Anderson, 2002).

Drop-shipping (DS): the wholesaler is responsible for making stock level decisions, keeping inventory and fulfilling customer orders while the retailer focuses on attracting customers.

Vendor managed inventory (VMI): the upstream node is responsible for inventory decisions for both the upstream and downstream node while the downstream node shares demand information with the upstream node. VMI has been implemented in the grocery industry (Clark and Hammond, 1997; Cachon and Fisher, 1997), the garment industry (Achabal et al., 2000), and the electronics industry (Dell computers, Lee and Chu, 2005).

Consignment VMI: is a variation of VMI. The supplier makes the inventory decisions and owns the products till they are sold. The retailer possesses the products for a very brief time period as they pass through the check-out barcode gun. Wall-Mart employs successfully the consignment VMI process.

Vendor hub: the supplier is committed in holding a minimum stock while the manufacturer obtains the products only when orders have been received. Vendor hub is a popular process in the electronics industry.

Upstream inventory control has been adopted by a significant number of organizations as an effective and efficient method to establish successful relations with supply chain partners that could lead to win-win situations for all supply chain participants. The grocery sector is one of the premier areas of VMI successful implementation. Studies have shown that VMI adoption has significantly improved firm performance resulting to cost reduction, service level improvement and created business opportunities for all supply chain partners (Clark and Hammond, 1997; Tyan and Wee, 2005). It has been suggested that the success of VMI in the grocery sector could be extended to other sectors too. The implementation of a decision support system for VMI in a major apparel manufacturer and over 30 of its retail partners improved dramatically customer service levels (Achabal et al. 2000). Another real life application of VMI has taken place in the household electrical appliances sector and specifically in Electrolux Italia. The results indicated that the inventory reduced significantly from 1998, when the VMI was introduced until 2000 (the year in which the process can be considered routine) while the Order Fill Rate, that is the percentage of orders that are satisfied considering both on time delivery of the appropriate quantity, increased considerably (De Toni and Zambolo, 2005). Interestingly, empirical findings suggest that small organizations rather than large firms enjoy higher returns from upstream inventory control. In addition, high employee involvement and more integrated logistics partnerships ensure success and add value to VMI (Kuk, 2004).

Two questions arise from practical applications: when is it beneficial to employ the new inventory control tactics and how are the supply chain processes affected. Literature on the subject has exploded during the last five years trying to address mainly the latter question, focusing on supplier/manufacturer-retailer supply chains, supplier-manufacturer supply chains exploring the effects of upstream inventory control in retailers competition, in the bullwhip effect and in transportation operations. In a recent work of ours (Skintzi et al. 2005) we have attempted to address the first question. We investigated two alternative inventory control policies in two node capacitated supply chains. Downstream and upstream inventory control policies were analyzed and rules, based on demand uncertainty and investment in warehousing facilities, that identify when each policy should be employed were derived. In addition, in the models developed, the members of the supply chain do not passively determine their optimal policies but with respect to each others strategy in a game theoretical setting. The optimization models and the dynamic approach enlighten the attributes of upstream inventory control policies, explore the implications in production and inventory levels and propose specific directions for managing inventory successfully while building upon the theory of VMI.

In conclusion, inventory control has traditionally been the main leverage in the struggle to effectively respond to demand uncertainty and fluctuations. Technological advancements and the realization that each company is part of one or more supply chains that dictate its performance and effectiveness have resulted to the adoption of cooperative strategies through information sharing and contracting. Empirical research indicates that there has been a significant alteration in the perspective and the way inventory is managed, providing evidence that a new inventory control policy has emerged called vendor managed inventory or upstream inventory control.

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