

Retail Supply Chain and Vendor Managed Inventory System: A Review

S M Sohel Rana¹, Abdullah Osman² and Md. Aminul Islam³

ABSTRACT

Vendor-managed inventory (VMI) is a new technique that has been popular for inventory management of retail supply chain. It is one of the most widely accepted partnering initiatives for improving multi-firm supply chain efficiency, also known as continuous replenishment or supplier-managed inventory. VMI partnership enables the suppliers to make vital decisions regarding inventory replenishment for retailers. Actually this VMI transfers the responsibility of inventory management from the retailers to the suppliers who may be obliged to meet a specific customer service goal. Implementation of VMI program offers a competitive advantage for retailers in terms of higher product availability and provides the supplier with opportunities to progress production and marketing efficiencies. Going into VMI contract may give the involved firms some benefits. But entering into a VMI can be challenging unless clear collaboration and communication between the manufacturer and supplier is established to ensure success. To be successful in VMI contract, it is necessary to ensure effective teamwork with strong participation by both manufactures and retailers. So before adopting VMI strategy in their supply chain, retailers should critically analyze its applicability.

Keywords: vendor managed inventory, retailing, supply chain management and replenishment

1. INTRODUCTION

Inventory management is one of the pivotal tasks of retail supply chain management. Retailers are always busy with lessening the risk of stock outs by carrying buffer inventory for items with high demand and now they are also realizing the cost of losing sales along with the costs of holding idle inventory. As retailers mostly deal with fast moving consumer goods, they always need to adjust supply chain strategies as per market demand. Initiatives are being taken to increase the velocity of products through the supply chain and increase the accuracy of inventory management. Cross docking and distribution center (DC)

¹ S M SOHEL RANA, School of Business Innovation and Technopreneurship. University Malaysia Perlis, smsohelrana@ymail.com

² ABDULLAH OSMAN, School of Business Innovation and Technopreneurship. University Malaysia Perlis, abdullahosman@unimap.edu.my

³ MD. AMINUL ISLAM, School of Business Innovation and Technopreneurship. University Malaysia Perlis, amin@unimap.edu.my

bypass are two initiatives to increase product velocity (Colby & Marguarette, 2005). However, Vendor-managed inventory (VMI) is a new technique for retail inventory management. It is one of the most widely accepted partnering initiatives for improving multi-firm supply chain efficiency, also known as continuous replenishment or supplier-managed inventory. VMI made its debut as a pilot program in the retail industry between Wal-Mart and Procter and Gamble (P&G) in the 1980's and has been adopted by many supply chains such as Dell, Barilla, Costco and Campbell's Soup. It was popularized in the late 1980's by Wal-Mart and Procter & Gamble and VMI became one of the key issues in the grocery industry's "quick response" (Mat et al., 2001).

Under VMI contract, the supplier manages inventory for the retailer (or manufacturer) and decides when and how much to replenish. VMI partnership enables the suppliers to make vital decisions regarding inventory replenishment for retailers. This means that the vendor monitors the buyer's inventory levels (physically or via electronic messaging) and makes periodic resupply decisions regarding order quantities, shipping and timing (Matt et al., 2001). Indeed, the purchase order acknowledgement from the vendor may be the first indication that a transaction is taking place. Under this situation buyers give up control of key resupply decisions and sometimes even transfer financial responsibility for the inventory to the supplier. Actually, this VMI transfers the responsibility of inventory management from the retailers to the suppliers who may be obliged to meet a specific customer service goal. The implementation of centralized planning, where an outside supplier manages the inventory at a retail distribution center for the products that this supplier delivers, is called Vendor Managed Inventory or VMI for short. Under such a VMI regime, the supplier might own the stock, or might not own the stock in the retail distribution centers. VMI dates back to the mid-nineties and has been promoted extensively by the international ECR-organization (Van der, 2006). It is important to note that many of the effects attributed to VMI stem from the better information exchange and could have been achieved without VMI.

VMI and Consignment

Sometimes there arises some confusion between VMI and consignment. These two are totally different inventory strategies that are sometimes used together. VMI refers to the tasks associated with managing the inventory provided by the supplier on the other hand consignment relates to the ownership of the inventory. One can have that is not consignment inventory, one can have consignment inventory that is not VMI and one can have inventory that is both consignment and VMI. These two terms are neither mutually exclusive nor mutually inclusive (Dave, 2013). With consignment stock, the buyer has no inventory related costs and benefits most. Total system inventory will drop and under certain conditions, may become even lower than the current inventory at the supplier (Vitasek, 2006). This means, that

buyer and supplier under certain conditions both can benefit, even with consignment stock. In many cases, however, VMI is implemented with consignment stock (CS) resulting in what Fanget al. (2011) referred to as Vendor Managed Consignment Inventory (VMCI). Under this combination, a retailer would physically hold purchased items in inventory but ownership of these items would reside with the supplier. The retailer does not pay for the delivered items until they are actually used or sold. Several studies analyzed and compared coordination contracts within VMI and non-VMI arrangements. On the other hand, in Retailer-Managed Inventory (RMI) system, the retailer owns and controls the inventory, Cachon (2003).

Benefits of Vendor Managed Inventory Implementing a VMI program have substantial benefits for the supply chain and each of the participants. It offers a competitive advantage for retailers with respect to higher product availability and provides the supplier with opportunities to progress production and marketing efficiencies (Ryu et al., 2013). The VMI leads the supplier to augment replenishment frequencies with smaller quantities and lessens inventory level for all involved in distribution and the supply chain (Waller et al., 1999; Dong et al., 2007; Yao et al., 2007; Chen & Chang, 2010). It also causes greater inventory cost saving and improved customer service levels (Achabal et al., 2000; Williams, 2000; Zavanella & Zanoni, 2009; Kang & Kim, 2012). Implementing vendor managed inventory may help manufacturers lessen excess inventory and run supply chain. VMI can also lessen risk as products are not owned by buyers until sold or consumed. It reduces overhead or opportunity cost that occurred from import duty and VAT. Vendors can improve margin as VMI enables vendors to increase profit, passing saving on to the product. It reduces operating costs with less paper as process will be executed through e-mail and soft file. It can also reduce time as of using electronic communication and through Inventory Control Application. Customers can be provided with materials automatically after the stock information has been transferred electronically. In case of shortages at the stock level of the customer, the replenishment run creates sales orders automatically. The creation of the sales order triggers the creation of a purchase order on the customer side. VMI programs have also resulted in significant saving of inventory costs and the benefits of VMI are attributed to information sharing between supply chain partners, increased flexibility in the supplier's production and delivery plan (Fry et al., 2001; Savasanelil & Erkip, 2010), economies of scale in production and delivery (Bookbinder et al., 2010; Nagarajan & Rajagopalan, 2008) and freight consolidation when the supplier has VMI agreements with multiple retailers (Cetinkaya & Lee, 2000; Cheung & Lee, 2002; Zavanella & Zanoni, 2009).

How VMI Works

VMI is inventory which is managed by the vendor or supplier and it means that the vendor determines when to replenish and how much to replenish. Vendor-managed inventory (VMI) is a coordination program between a vendor, often a manufacturer or supplier and a buyer, often a retailer, in which the supplying organization takes full control of inventory management and replenishment decisions for retailers. The supplier in the relationship owns everything as far as planning and shipping. The customer provides a snapshot of what stock is in the warehouse and how much it is used before. The supplier inputs that stock and usage data into the VMI tool and creates a forecast and replenishment plans accordingly. In a VMI partnership, the supplier, usually the manufacturer but sometimes a reseller or distributor, makes the main inventory replenishment decisions for the consuming organization. This means that the vendor monitors the buyer's inventory levels (physically or via electronic messaging) and makes periodic resupply decisions regarding order quantities, shipping, and timing. Transactions customarily initiated by the buyer (such as purchase orders) are initiated by the supplier. Under VMI, the buyer provides the vendor with inventory information and the vendor uses this information to monitoring inventory or placing orders. Hence passing retailer's inventory management duty and responsibility of inventory replenishment decisions from buyer to vendor is the cornerstone of VMI (Copacino, 1993; Waller et al., 1999; Kaipia & Tanskanen, 2003; Holweg et al., 2005; Tang, 2006; Dong et al., 2007; Gronaltand, 2008). The retailer's role in a VMI arrangement shifts from managing inventory to simply renting retailing space to the vendor (Chen et al., 2012).

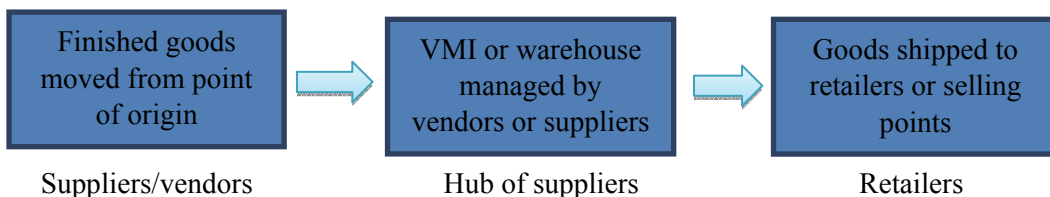


Figure 1: VMI Work Flow Chart

The Reality of VMI

Going into VMI contract may provide the involved firms some benefits. But entering into a VMI can be challenging unless clear collaboration and communication between the manufacturer and supplier is established to ensure success. Demand visibility is also essential to a working VMI program. VMI seeks to improve the aggregate performance of a supply chain. Various studies showed that supply chain members can reap substantial benefits from VMI

implementation. Examples of VMI benefits include but are not limited to reduce lead-times and stock-outs, improved control of the bull whip effect, increased service levels and reduced in costs (Angulo et al., 2004; Cheong & Lee, 2002; Kulp et al, 2004; Kaipia et al 2002; Waller, 1999). However, other research escorted some doubt as to whether VMI would always be beneficial to all supply chain partners. For instance, based on an EOQ (Economic Order quantity) model, Yao et al. (2007) found that inventory cost reduction in VMI arrangements depends on vendor–retailer ordering and holding cost ratios; whereas Bookbinder et al., (2010) compared the costs incurred by each party in a single manufacturer–retailer VMI arrangement under independent decision making, VMI and centralized decision making. Haisheng et al., (2009) used evolutionary game theory to show that VMI partnership might not be advantageous to the supplier at early stages of implementation, even though the whole chain would benefit by enhancing the transaction quantity in the long run. It is often seen in retail practice that VMI projects do not have the success that VMI theoretically should have. Possible reasons might be (Blatherwick, 1998); the retailer is forcing the supplier to maintain inventory levels at the retail distribution centers between the same limits the retailer used prior to VMI. In such cases the push orders that are being generated by the supplier are identical to the pull orders that the retailer would have generated.

The only difference is that the burden of generating the orders has shifted from retailer to supplier. The retailer is forcing the supplier to keep the inventory at the retail distribution center in consignment (or vendor owned inventory, VOI), without giving the supplier the freedom to change inventory levels and delivery moments to recoup his extra costs (Yao et al., 2007). Moreover competition in retail is fierce and negotiations with suppliers are tough while VMI requires investment in a lasting partnership. Some of the retailers feel that VMI creates dependencies and might dwindle negotiation position and they also believe that a VMI implementation should be simple and easy to implement, using standard IT-system components. But companies are part of many supply chains and centralized control of the whole web of supply chains with full visibility is highly unrealistic. Fransoo et al., (2001), study the effects of limited information exchange in such a multi-echelon multi-company inventory planning situation. They conclude that managing the interfaces between independent supply chains, by communicating required service levels and selectively limiting the amount of information that flows across, already leads to reasonable results. In terms of VMI it could mean aiming at achieving certain product availability in the retailer's distribution centers. (Fransoo et al., 2001). So before adopting VMI strategy in their supply chain, retailers should critically analyze its applicability.

Conclusions

The management of inventory by the supplier continues to draw attention in many industries as VMI provides some compelling benefits to the involved parties. MI

represents a business model in which the buyer of a service or good provides certain information to a supplier of that product regarding the quantity of goods sold and liquid stocks. Based on information obtained supplier takes full responsibility for maintaining agreed inventory of the material, where buyer only has to inform about the increase or decrease of desired inventories. For implementing VMI, organizations have to invest in technology development and restructuring. However successful implementation largely depends on sound business processes and interpersonal relationships. A purely technical solution without regard for the people involved is unlikely to deliver the benefits described above. To be successful in VMI contract, it is necessary to ensure effective teamwork with strong participation by both manufactures and retailers. Moreover, trust between supply chain partners is critical. Both must experience and recognize vivid benefits or the relationship is doomed. Finally, organization enticements and metrics must be lined up with VMI goals. Undoubtedly VMI relationships will fail without needed relationships, metrics and organizational structure.

REFERENCES

- Achabal, D. D., McIntyre, S. H., Smith, S. A., & Kalyanam, K. (2000). A decision support system for vendor managed inventory. *Journal of Retailing*, 76(4), 430–454.
- Angulo, A., Nachtmann, H., & Waller, M. A. (2004). Supply chain information sharing in a vendor managed inventory partnership. *Journal of Business Logistics*, 25(1), 101–120.
- Blather, W. A. (1998). Vendor-managed inventory: Fashion fad or important supply chain strategy? *Supply Chain Management: An International Journal*, 3(1), 10–11.
- Bookbinder, J. H., Gumus, M., & Jewkes, E. M. (2010). Calculating the benefits of vendor managed inventory in a manufacturing-retailer system. *International Journal of Production Research*, 48, 5549–5571.
- Cachon G. (2003). Supply chain coordination with contracts. In: Graves S, de Kok T. *Hand books in operations research and management science: Supply chain management*, 229–340.
- Cetinkaya, S., & Lee, C., (2000). Stock replenishment and shipment scheduling for vendor-managed inventory systems. *Management Science*, 46(2), 217–232.
- Chen, T.H., & Chang, H.M.,(2010).Optimal ordering and pricing policies for deteriorating items in One-vendor multi-retailer supply chain. *International Journal Advance Manufacturing Technology*, 49(1–4), 341–355.
- Cheung, K. L., & Lee, H. L. (2002). The inventory benefit of shipment coordination and stock rebalancing in a supply chain. *Management Science*, 2, 48(2), 300–306.
- Chen, J., Zhang, H., & Sun, Y. (2012). Implementing coordination contracts in a manufacturer Stackelberg dual-channel supply chain. *Omega*, 40, 571–583.

- Colby, R. C., & Marguarette, T. D. (2005). An Analysis of Current Supply Chain Best Practices in the Retail Industry with Case Studies of Wal-Mart and Amazon.com. *Georgia Institute of Technology*.
- Copacino, W.C. (1993). Logistics strategy: How to get with the program. *Traffic Management*, 32(8), 23–24.
- Dave, P. (2013). Vendor Managed Inventory: What is it and when does it make sense to use it. Retrieved on 10 November 2014. www.google.net.
- Dong, Y., Xu, K. F., & Dresner, M., (2007). Environmental determinants of VMI adoption: An exploratory analysis. *Transp. Res. Part E: Logistics Transp. Rev.*, 43(4), 355–369.
- Fang, X., So, K. C., & Wang, Y. (2008). Component procurement strategies in decentralized ATO systems with time-dependent pricing. *Management Science*, 54(12), 1997–2011.
- Fransoo, J., Wouters, M., & Kok, T. D. (2001). Multi-echelon multi-company inventory planning with limited information exchange. *Journal of the Operational Research Society*, 52, 830–838.
- Fry, M., Kapuscinski, R., & Olsen, T. (2001). Coordinating production and delivery under a (z, Z)-type Vendor-managed inventory contract. *Manufacturing Services Operation Management*, 3(2), 151–173.
- Gronalt, M., & Rauch, P. (2008). Vendor managed inventory in wood processing industries: A case study. *Silva Fenn*, 42(1), 101–114.
- Haisheng, Y, Zeng, A. Z., & Zhao, L. (2009). Analyzing the evolutionary stability of the vendor-managed inventory supply chains. *Computers & Industrial Engineering*, 56, 274–282.
- Holweg, M., Disney, S., Holmström, J., & Småros, J. (2005). Supply chain collaboration: Making sense of the strategy continuum. *European Management Journal*, 23(2), 170–181.
- Kaipia, R., Holstrom J., & Transkanen, K. (2002). VMI: What are you losing if you let your customer place orders? *Production Planning and Control*, 13(1), 17–25.
- Kaipia, R., & Tanskanen, K. (2003). Vendor managed category management: An outsourcing solution in retailing. *Journal Purchasing Supply Management*, 9(4), 165–175.
- Kang, J. H., & Kim, Y. D. (2012). Inventory control in a two-level supply chain with risk pooling effect. *International Journal Production Economy*, 135(1), 116–124.
- Kim, B., & Park, C. (2010). Coordinating decisions by supply chain partners in a vendor- managed inventory relationship. *Journal of Manufacturing Systems*, 29, 71–80.
- Kulp, S. C., Lee, H. L., & Ofek, E. (2004). Manufacturer benefits from information integration with retail customers. *Management Science*, 50(4), 431–444.
- Nagarajan, M., & Rajagopalan, S. (2008). Contracting under vendor managed inventory systems using holding cost subsidies. *Production and Operations Management*, 17(2), 200–210.

- Savaseneril, S., & Erkip, N. (2010). An analysis of manufacturer benefits under vendor-managed systems. *IIE Trans.*, 42(7), 455–477.
- Tang, C. S. (2006). Perspectives in supply chain risk management. *International Journal Production Economy*, 103(2), 451–488.
- Van der Vlist, P., & Broekmeulen, R. (2006). Retail consolidation in synchronized supply chains. *Zeitschrift für Betriebswirtschaft*, 76, 165–176.
- Vitasek, K., Manrodt, K. B., & Abbott, J. (2005). What makes a lean supply chain? *Supply Chain Management Review*, 9(7), 39–45.
- Waller, M., Johnson, E. M., Davis, T. (1999). Vendor managed inventory in the retail supply chain. *Journal of Business Logistics*, 20(1), 183–203.
- Williams, M. (2000). Making consignment and vendor-managed inventory work for you. *Hospitality Material Management Q.*, 21(4), 59–63.
- Yao, Y., Evers, P. T., & Dresner, M. E. (2007). Supply chain integration in vendor-managed inventory. *Decision Support Systems*, 43, 663–674.
- Zavanella, L., & Zanoni, S. (2009). A one-vendor multi-buyer integrated production-inventory model: The ‘Consignment Stock’ case. *International Journal Production Economy*, 118(1), 225–232.