

VENDOR MANAGED INVENTORY IN SMEs

ATUL B. BORADE & SATISH V. BANSOD

ABSTRACT

Recent developments in the field of information technology (IT) have changed the information exchange process in supply chain. Today, the ability of a firm to transfer the knowledge and information across global boundaries is a key functional aspect of supply chain management. The advent of information sharing mechanisms, like Vendor managed Inventory (VMI), allowed organizations to trade in real time and improved the business performance. Therefore understanding its implications in e-environment is exceptionally important issue for organizations. The issue is much complex for SMEs. This paper evaluates motives, drivers and benefits of VMI practices in e-environment. We attempt to compare VMI in large organizations and small organizations. Based on the findings it can be concludes that there is a significant difference in strategic aspects for SMEs and other organizations.

Key Words: Vendor managed inventory, information technology, information sharing and small and medium enterprises, e-supply chain.

1. INTRODUCTION

Supply chain includes the flow of physical goods and associated information from the source to the consumer. Key supply chain management activities like production planning, purchasing, materials management, distribution, customer service, sales forecasting heavily depends upon timely information. The advent of web-based information transfer between various supply chain partners has changed the nature of information management in supply chains (Johnson and Whang, 2002). In collaborative business processes like VMI, CRPF effective information sharing is an important success criterion for companies (McLaren *et al.*, 2002). A trend like VMI demands the supplier to control the inventory of the customer; and most importantly to take replenishment decisions for the customer through real time information sharing. Furthermore, advances in information integration have enabled supply chains to reap significant returns to investment in terms of decreased order cycle times, increased agility to respond to customer demand, and increased firm profitability (Brynjolfsson and Kahin 1996; Brynjolfsson *et al.*, 2000). Hence, it is important to consider how IT can support better supply chain designs in the emerging e-business environment.

Organizations have to heavily relay on soft wares for managing the e-supply chain; which poses a range of vulnerabilities. Today, advances in software viz. hardware

accelerators, silicon chips, optical processors and new learning algorithms overcome the shortcomings of software. The new wave of software tackles the enterprise resource planning (ERP), warehouse management, and transportation management, advanced planning and scheduling, satellite tracking, computer-assisted ordering, database management and mining, electronic data interchange (EDI), intranets and extranets, point of sales tracking, i.e., every aspect of order fulfillment process. An advanced stage may be interactive decision-making software. (Zaharudin *et al.* 2002). The more advanced and more optimistic information technology companies have established policies designed to phase out non-electronic orders (from customers and to suppliers). Most of these companies have been heavily invested in EDI for several years and are transitioning as quickly as possible to Web-based systems (Fawcett *et al.*, 2005).

Lee and Whang (2000) studied and evaluated the popular supply chain strategies, such as Quick Response (QR), Efficient Consumer Response (ECR), Vendor Managed Inventory (VMI) and Continuous Replenishment Programs (CRP) etc. where information sharing practice is cornerstone of business functions. When we discuss these strategies, we know that these are being implemented in large and multinational organizations, but what about small and medium enterprises (SMEs)? Certainly, in today's extremely volatile and unpredictable business environment small and medium enterprises (SMEs) cannot work as standalone units. The closer look reveals that during the last decade many SMEs also have tried to adjust their business operations to cope with the increased demands for customized manufacturing (Sharma and Bhagwat, 2005). The fact is, multinational firms and large enterprises can invest huge capital for implementing latest information technology tools to carry day-to-day operations, but the investment and implementation is quite difficult for SMEs. Over time, characteristics of organizations used to influence the supply chain design and its management but now effective supply chain management symbolizes organization's performance. It is also reported that despite the huge investments in advanced information systems, a tremendous amount of communication still takes place in the old fashion; that is, via fax and telephone especially in SMEs. This motivates to find the perceived differences of VMI practices in SMEs and other industries.

This paper offers a comparative analysis of the VMI in SMEs and large organizations. The remainder of this paper is organized as follows. Section 2 offers the literature review on research practices in supply chain management under e-environment. Section 3 presents empirical evidence of differences in SMEs and other organizations, in context of VMI. Lastly simple conclusions are drawn.

2. REVIEW OF LITERATURE

In this section we review the literature to study the information sharing practices like VMI through Information Technology tools; in addition we also studied successful

adoption of VMI in industries. It is reported that when only order information is shared the result is efficiency gain only and both parties' shares IT cost. On the other hand, with advanced information sharing system such as VMI, buyer's cost is borne by supplier but supplier gains valuable insights of day-to-day business (Morrel and Ezingard, 2002). In today's technology-intensive world companies must understand the value of e-business VMI practices. McLaren *et al.*, (2004) explored impacts of e-business and emerging technologies in business processes. They found that the nature of IT investments and e-business applications in SCM changes from industry to industry. Some organizations get early benefits from investment whereas others take some time for repayment.

Johnson and Wang (2002) presented a framework that divides the various forms of e-business applications into three categories: e-Commerce, e-Procurement, and e-Collaboration. e-Commerce allows a network of supply chain partners identify and respond quickly to changing customer demand captured over the Internet. e-Procurement allows companies to use the Internet for procuring various materials, as well as handling a range of logistical services such as transportation and warehousing. e-Collaboration facilitates coordination of various decisions and activities. Since the 1990s, the pervasive adoptions of Internet and Web technology have promised a ubiquitous and less costly way to tie companies and their business partners together in the supply chain. The great collaboration made e-Commerce buzzwords like "B2B" and "B2C" known to almost everybody in business circles. With the advancement of information technology, the collaboration of business partners will continuously improve the effectiveness of SCM. (Chou *et al.*, 2004).

The successful adoption of the VMI worldwide can be seen in the literature. For example, Toni and Zamolo (2005) revealed that vendor-managed inventory is also used in household electrical appliances sector. Taking Electrolux Italia as an example, the implementation of this technique is presented and analyzed, highlighting the various processes involved (sales forecasting, capacity forecasting, master planning, replenishment need calculation, dispatch planning, shipping), parameters (target stock, replenishment need, dispatch plan, assigned stock, etc.) needed to regulate vendor managed inventory. The paper points out the benefits obtained following the implementation of this technique and presents variables that define and characterize the conditions under which it can be applied. Similar findings are reported by Tyan and Wee (). This study considers the retailer-supplier partnership through a vendor managed inventory (VMI) system. The characteristics of a VMI system and a retailer-supplier power relationship are discussed in some detail with a case illustration to examine the practical implementations of the system in the Taiwanese grocery industry. It is concluded that, VMI not only has the ability to reduce costs, but also to improve service levels and create business opportunities for both parties in the supply chain. Thus, it is

considered as one of the main systems in a strategic alliance. Dorling in (2005) identified the key determinants of successful vendor managed inventory (VMI) and strategic supply chain relationships in the New Zealand (NZ) food industry. Author primarily used action research, supported by a literature review, triangulation and case studies from other industries and countries. Study highlighted key factors impacting the success of VMI and strategic supply chain relationships. These factors were integrated into a framework that provides a model for practitioners to follow when establishing VMI and strategic supply chain relationships in the NZ food industry. Our research is inspired by the research made by Kuk (2004). This study used the extended limits-to-value model to frame four research hypotheses related to the effects of organizational size, employee involvement, and logistics integration on the expected and perceived values of vendor-managed inventory (VMI) as implemented in the electronics industry. Most of the findings supported the hypotheses. Specifically, that supply chain members working for organizations with high levels of employee involvement and logistics integration were more likely to realize the potential values of VMI. However, contrary to the notion that large organizations have more slack resources in technology adoption and implementation, VMI benefited small organizations most. The results motivated us to find the differences in perception and strategic factors, while working in VMI environment for large and small organizations.

3. RESEARCH METHODOLOGY

3.1 Motivation and Research objective

The purpose of the study was to find out perceptions and trends in collaborative supply chain practices, like VMI. The study was undertaken to investigate if there were any distinct differences in perceptions and practices adopted by SMEs and large organizations. The study sets the ground for potential design and redesigns of supply chains in SMEs and other organizations.

3.2 Research Instrument

The survey questionnaire was designed with the knowledge of previous survey reports and questionnaires as well as in consultation with supply chain managers. Four hypothesis were formulated which focused on organizational objectives, critical success factors, drivers and implications of collaborative supply chain practice like VMI. For this a five-point Likert scale was provided. The electronic survey method used for survey administration. Around 500 large and 500 SMEs were chosen for the survey. In sampling it was tried to ensure that the sample companies represents all business segments of 500 large companies only 112 companies responded however out of 500 SMEs only 86 responded positively. This gives a response rate between 17% and 21% that can be considered as a good response rate.

3.3 Hypothesis Formulations

Design of supply chain and drivers, objectives, success factors and results that are observed in VMI practices for large organizations and SMEs won't be same. To explore the dissimilarities, among the SMEs and other organizations following hypothesis were formulated and tested.

- H₁. Compared to others; SMEs assign more importance to profit while adopting VMI.
- H₂. SMEs adopts VMI due to competition and others due to global environment.
- H₃. Compared to large industries, SMEs lacks latest IT tools.
- H₄. For SMEs, the major advantage of VMI is clear demand visibility than other advantages.

3.4 Hypothesis Testing.

T-test has been used to test the hypothesis using XLSTAT 2008 version.

Hypothesis 1

To test this hypothesis the respondents were asked about the importance assigned by their organization to most important organizational objective while adopting VMI. They were requested to respond on the five-point Likert scale. To test this hypothesis, the

Table 1
Independence Sample T-test for Observed Organizational Objectives
(SMEs versus others)

<i>Item for comparisons</i>	<i>Test Results</i>	<i>Mean Value</i>
a) Lead Time Reduction	2.883 ¹	4.3649 ⁴
	99.148 ²	3.865 ⁵
	0.039 ³	
b) Improvement in forecasting accuracy	2.437 ¹	4.5621 ⁴
	98.049 ²	4.106 ⁵
	0.032 ³	
c) Improvement in customer service	2.005 ¹	3.6102 ⁴
	100.899 ²	4.837⁵
	0.009 ³	
d) Improved profits	2.789 ¹	4.6329⁴
	93.782 ²	3.228 ⁵
	0.043 ³	
e) Improved return on investment	2.576 ¹	3.2603 ⁴
	97.407 ²	2.985 ⁵
	0.162 ³	

Notes: ¹ t-value, ² Degree of freedom, ³ Two-tailed significance, ⁴ Mean of SMEs, ⁵ Mean of others.

importances assigned by the respondents to organizational objectives are compared on independent sample t-test (Table 1). The results of t-tests indicate that, the mean values of importance assigned by SMEs to profit are more than the rest of organizations. The differences in these mean values are also significant at a level of 0.05 or below. Therefore, the hypothesis is accepted.

Hypothesis 2

To test this hypothesis the respondents were asked about the importance assigned by their organization to most important strategic driver implementing VMI. They were requested to respond on the five-point Likert scale. To test this hypothesis, the importance assigned by the respondents to strategic driver is compared on independent sample t-test (Table 2). The results of t-tests indicate that, the mean values of importance assigned by SMEs to competition as a strategic driver is more, where as for other organizations the driver is global environment. The differences in these mean values are also significant at a level of 0.05 or below. Therefore, the hypothesis is accepted.

Table 2
Independence Sample T-test for Observed Strategic Drivers While Adopting VMI
(SMEs versus others)

<i>Item for comparisons</i>	<i>Test Results</i>	<i>Mean Value</i>
a) Competition	2.913 ¹ 103 ² 0.017 ³	3.791 ⁴ 2.669 ⁵
b) Shorter product life cycle	2.737 ¹ 98.049 ² 0.047 ³	3.839 ⁴ 3.701 ⁵
c) Global supply chain	2.363 ¹ 102.897 ² 0.022 ³	3.240 ⁴ 3.945 ⁵
d) Corporate restructuring	2.541 ¹ 99 ² 0.076 ³	2.745 ⁴ 3.842 ⁵

Notes: ¹. t-value , ². Degree of freedom, ³. Two-tailed significance, ⁴. Mean of SMEs , ⁵.Mean of others.

Hypothesis 3

To test this hypothesis the respondents were asked to indicate the hindrances for VMI initiatives with their supply chain partners. An independent sample t-test is conducted to test the hypothesis (Table 3). The results of the t-test verify that SMEs lack suitable IT structure compared to other organizations. This result is significant at a level of $p \leq 0.01$, therefore the hypothesis is accepted.

Table 3
Independence Sample T-test for Obstacles Observed While Adopting VMI
(SMEs versus others)

<i>Item for comparisons</i>	<i>Test Results</i>	<i>Mean Value</i>
a) Ineffective organizational structure	2.883 ¹ 100 ² 0.006 ³	2.950 ⁴ 2.562 ⁵
b) Lack of suitable Information technology infrastructure	2.174 ¹ 99 ² 0.032 ³	3.667⁴ 3.374 ⁵
c) Improper decision support tool	2.233 ¹ 98 ² 0.054 ³	3.338 ⁴ 2.043 ⁵
d) Lack of trust and mutual understanding between supply chain partners	2.113 ¹ 102 ² 0.008 ³	3.107 ⁴ 3.569⁵
e) Internal /External Integration	2.437 ¹ 98.049 ² 0.066 ³	2.990 ⁴ 2.773 ⁵

Notes: ¹ t-value, ² Degree of freedom, ³ Two-tailed significance, ⁴ Mean of SMEs, ⁵ Mean of others.

Hypothesis 4

Regarding advantages of adopting VMI in supply chain, respondents were asked to indicate the advantages made by their organizations. An independent sample t-test is conducted to test the hypothesis. The results are exhibited in (Table 4).

Table 4
Independence Sample T-test for Operational Areas Affected After VMI Adoption
(SMEs versus others)

<i>Item for comparisons</i>	<i>Test Results</i>	<i>Mean Value</i>
a) Production planning	2.116 ¹ 105 ² 0.048 ³	4.396 ⁴ 4.086 ⁵
b) Forecasting	2.344 ¹ 104 ² 0.023 ³	4.815⁴ 4.753 ⁵
c) Replenishment	2.027 ¹ 104 ² 0.005 ³	3.991 ⁴ 4.527 ⁵
d) Inventory control and management	2.692 ¹ 100 ² 0.028 ³	2.859 ⁴ 3.263 ⁵
e) Logistics and distribution management	2.348 ¹ 99 ² 0.061 ³	3.991 ⁴ 4.761⁵

Notes: ¹ t-value, ² Degree of freedom, ³ Two-tailed significance, ⁴ Mean of SMEs, ⁵ Mean of others.

CONCLUSION

Global supply chain management is a complex issue for organizations today. However, the advances in information technology enable organizations to integrate with other supply chain partners effectively. It is found out that, the information integration through IT enables supplier to react in real time to market conditions. This paper explored the VMI as a possible strategy to effectively handle e-supply chain management. It is concluded that the deployment of VMI can have a large impact within and across organizational boundaries. The important thing that has been observed in this study is that the strategic drivers, advantages, and supply chain design for SME would be significantly different than that of other organization. It is found that supplier and manufacturer can obtain significant performance improvement in terms of inventory levels and cost. The results of the study reveals that IT relates to firms strategic capabilities and could provide an effective advantage to business. Thus a supply chain partnership through VMI module between large volume trading partners may maximize value for the end customer, and reduce operating expenses in the supply chain.

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Atul B. Borade

Jawaharlal Darda Institute of Engineering and Technology
Yavatmal (M.S.), INDIA
E-mail: atulborade@rediffmail.com

Satish V. Bansod

Ram Meghe Institute of Research and Technology
Badnera (M.S.), INDIA
E-mail: satish1bansod@rediffmail.com