Analysis of Vendor Managed Inventory System in Manufacturing Industry: A Case Study

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ABSTRACT

Vendor managed inventory is gaining great momentum in business organization.VMI also known as continuous replenishment or supplier managed inventory, is one of most widely discussed partnering initiatives for encouraging collaboration and information sharing among trading partners. It is a supply chain initiative where the vendor decides on the appropriate inventory levels of each of the products and the appropriate inventory policies to maintain those Managed Inventory is gaining great momentum in business organization. The retailer provides the vendor with access to its real-time inventory level. In this partnership program, the retailer may set certain service-level and/or shelf-space requirements, which are then taken into consideration by the vendor

Key words: VMI, Bullwhip Effect, Demand, Forecast

INTRODUCTION

The basic principle of VMI is that the vendor, or supplier, becomes responsible for managing the inventory at the customer's site. In contrast to buyers who often manage a broad portfolio of purchased items, suppliers are usually responsible for a more limited range of products of which they have more specific knowledge, and therefore should be better in forecasting and managing the flow of their products through to the end consumer. Making the supplier responsible for replenishment should result in inventory and logistics costs being reduced throughout the total supply chain. This research is aimed at creating a viable model of a single manufacturer single supplier collaborative supply chain system using a Vendor Managed Inventory (VMI) system.

Steps for VMI Implementation

Each Step in this process is extremely important. Skipping or not completing any steps will have a major impact on the success of your VMI program. Plan to invest the necessary amount of time on each step. Before you begin the setup process, both the manufacturer and the distributor must be comfortable with using EDI or some form of routine data sharing.

Step 1 – Senior Sponsorship

Since the business paradigm is changing, senior management must make a firm commitment to this new process. VMI must have senior management sponsorship. It should be identified as a strategic objective and then communicated throughout the organization. Senior management must commit to the costs involved, and the manpower needed for setup/maintenance. For the distributor, they must also become comfortable with the concept of having someone else manage their inventory.

Step 2 – Employee Acceptance

Get all employees to buy into the concept, especially the person currently responsible for maintaining the inventory levels. Without their acceptance, your program will never work. They must understand that VMI will not push them out of a job. It will free up some of their time to allow them to be more productive in other areas. Employees should be given a complete

overview of what VMI will mean to the company and the reasons why it's being done.

Step 3 – Synchronize Files

Synchronize the Distributors Product Files with the Manufacturers. This step alone is one of the greatest benefits you will receive from VMI. Synchronizing means that you must match the manufacturer's product data with the distributor's product data. Are there old, obsolete items on the file? Are the correct product numbers being used? Have new product numbers been properly communicated to the distributor? Any time there is a change to the product catalogue, the manufacturer must share the data with their VMI partners. Your initial data synchronization is extremely important as well as the ongoing synchronization that will be needed.

Step 4 – EDI Testing

Extensive testing of all EDI sets to be used. The manufacturer and distributor must work very closely together to validate that the data is being properly sent/received. For example: Does the Quantity on Hand that is being received by the manufacturer match the Quantity on Hand in the Distributor's stock? Is Quantity Sold being properly sent? You should check a variety of items in different categories (A, B, C). EDI testing many take many tries and adjustments before it is finally correct.

Step 5 – Acceptance and Measurements

The Distributor must understand and agree with the stocking plan the Manufacturer is creating. Even though the exact method may be a proprietary method, the distributor should still have an understanding of how the plan is calculated. This will help avoid the future question: "Why did they send us this product if we don't need it?"

Additionally, predetermined Inventory Turns, Fill Rates and Service Levels should be targeted. The Distributor should monitor their current performance for comparison to later results. Both parties must agree upon the frequency of replenishment (daily? once/twice per week?). Ideally, the Distributor should have at least one year's worth of measurements prior to VMI for comparison to later results.

Step 6 – Point of Sale (POS) History

The Distributor sends the Manufacturer his POS (Point of Sale) History file, usually 1-2 years (Disk or Email). This will allow the manufacturer to base the inventory plan on direct sale data rather than data from the distributors past ordering history. The format of the file must be compatible to the needs of the manufacturer. Then the Distributor sends an EDI #852 All Item Refresh. This tells the status and stock level of every item they have. Make sure to verify both sets of data. This will be the last and most important point.

Note: The standard #852 only sends those products that had a change in position since the last transmission (if no activity took place for that item, then the item isn't sent). A #852 All Item Refresh sends every item.

Step 7: The Distributor makes a sale and enters that transaction into their computer.

Step 8: On a daily/weekly basis the Distributor sends a #852 Product Activity. This reports a change in position on any item since the last #852.

Step 9: The Manufacturer receives the #852 and updates the Distributors Stock Plan. Once an Item or Items have hit their Reorder Point (ROP), the Manufacturer creates an Order.

Step 10: The Manufacturer sends out an #855 Purchase Order Acknowledgment to the Distributor. This lets the distributor update their system with the newly created PO. During the beginning stages of your VMI partnership, it is important to have the Distributor review the #855 and point out any problems.

Step 11: The Manufacturer picks and ships the order and transmits a #857 Advance Ship Notice. This tells the distributor exactly what is being sent and when it"s shipping.

Step 12: When the shipment is received, the Distributor transmits a #861 Receipt Advice. This tells the manufacturer exactly what was received. The manufacturer can then match this to his Purchase Order to determine any potential problems (miss-shipped, et

LITERATURE REVIEW

Yan Dong [2002] find that a VMI program will be effective in reducing the inventory-related costs for the system of buyer-supplier channel as a whole, even without changing any cost characteristics of the channel or demand level at the end market.

Jonah Tyan [2003] discusses the retailer–supplier partnership (RSP) in a supply chain using VMI. He find 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

Meiping Xie [2006] constructed a model for supply chain system, which is composed of m vendors and n identical retailers and study the conflicts between vendors and retailers. He find that if the retailers' total demand equals vendors' supply quantity then there are no conflicts among retailers and vendors.

Yuliang Yao [2007] developed an analytical model that helps to provide a better understanding of how important supply chain parameters, namely ordering costs and carrying charges, affect the inventory cost savings to be realized from VMI and the distribution of these savings between buyers and suppliers.

Joseph G. Szmerekovsky [2008] developed one manufacturer and one retailer model to study the effect on manufacturers and retailers of attaching radio frequency identification (RFID) tags at the item level in a vendor managed inventory (VMI) system.

Choonjong Kwak [2009] perform a simulation based experiment and proposed an adaptive VMI (Vendor Managed Inventory) model that controls replenishment quantity adaptively depending on a change in customer demand at each replenishment period in a two-echelon supply chain with unstable customer demands. The proposed adaptive inventory control model, supported by the situation reactive approach with the retrospective analysis, successfully relaxed an assumption of a stationary distribution for customer demands.

Bowon Kim [2010] develops a model, in which the retailer and the vendor should coordinate their decisions in order to maximize their individual profit or the total profit combining the two participants together. He suggest that the vendor should take into account the demand pattern throughout the product life cycle (PLC) when it decides its capacity commitment, which will affect its inventory management cost during the PLC, while the retailer should change the retail price over the PLC so as to maximize the revenues and minimize the inventory cost at the same time.

Shu-Hsien Liao [2011] formulated an integrated location–inventory distribution network problem which integrates the effects of facility location, distribution, and inventory issues under the VMI setup and presented a Multi-Objective Location–Inventory Problem (MOLIP) model and investigated the possibility of a multi-objective evolutionary algorithm based on the Non-dominated Sorting Genetic Algorithm (NSGA2) for solving MOLIP.

Simone Zanoni [2011] analyzed two issues, which are the 'VMI with consignment' inventory policy and the 'Learning Curve'. He analytically modelled the policies to investigates and compares different policies that the vendor should adopt to exploit the advantages offered by the VMI with consignment agreement when the vendor's production process is subject to learning effects

Jia Shu [2012] study and formulate the logistics network design problem (which incorporates the location, transportation, pricing, and warehouse-retailer echelon inventory replenishment decisions) as a set-packing model, with vendor managed

inventory in which the company is in charge of managing inventory for its downstream warehouses and retailers, and can choose whether to satisfy each retailer's demand and solve it using branch-and-price..

DEGREE OF IMPORTANCE OF VMI ELEMENTS IN MANUFACTURING INDUSTRY

Table 1.1 gives the mean score of Degree of Importance of VMI elements in various Manufacturing industry.

Sr. No.	Groups	Count	Sum	Averages	Average of Averages
1	Job satisfaction	20	69	3.45	
2	Group Incentive Scheme	20	35	1.75	
3	Planning	20	72	3.6	
4	Location of Industry	20	68	3.4	
5	Commitment	20	70	3.5	
6	Top Management Commitment	20	54	2.7	
7	Team Work	20	38	1.9	2.77
8	Effective Communication between Industry and customers	20	62	3.1	
9	Organization Policies	20	74	3.7	
10	Data Communication and analysis	20	37	1.85	
11	Monitoring and Reporting	20	33	1.65	
12	Employee Training	20	64	3.2	
13	Employee feedback and suggestion	20	63	3.15	
14	Top Management Support	20	55	2.75	
15	Customer feedback & suggestion	20	39	1.95	
16	Frequent and Reliable Service	20	68	3.4	
17	Customer Satisfaction	20	71	3.55	
18	Customer Awareness	20	34	1.7	
19	Multifunctional workers	20	30	1.5	
20	Standardization	20	73	3.65	

DEGREE OF IMPORTANCE OF VMI ELEMENTS IN INDUSTRYS

Table 1.1 indicates that Organization Policies has got the maximum value (i.e. 74), hence is the most important element of VMI for Industries and Standardization got 73, as mean score, which is second most important element of VMI whereas, Multifunctional has got 30 as mean, which is the least one, hence it can be termed as least important in manufacturing

industry.

From Table 1.1, other most important elements are Planning ,Customer satisfaction ,Commitment, Job satisfaction ,Location of Industry, Frequent and reliable service, Employee training. Employee feedback and suggestion Table 1.1 also reveals the least important elements and these elements are Effective Communication between Industry and customers, Top Management Support, Top Management Commitment, Customer feedback & suggestion, Team Work, Data Communication and analysis, Group Incentive Scheme, Customer Awareness, Monitoring and Reporting, Multifunctional workers

DEGREE OF DIFFICULT OF VMI ELEMENTS IN MANUFACTURING INDUSTRY

Table 1.2 gives the mean score of Degree of Difficulties of VMI elements in various manufacturing industry.

Sr. No.	Groups	Count	Sum	Averages	Average of Averages
1	Job satisfaction	20	35	1.75	
2	Group Incentive Scheme	20	42	2.1	
3	Planning	20	47	2.35	
4	Location of Industry	20	56	2.8	
5	Commitment	20	38	1.9	
6	Top Management Commitment	20	46	2.3	
7	Team Work	20	32	1.6	1.87
8	Effective Communication between Industry and customers	20	36	1.8	
9	Organization Policies	20	27	1.35	
10	Data Communication and analysis	20	43	2.15	
11	Monitoring and Reporting	20	49	2.45	
12	Employee Training	20	24	1.2	
13	Employee feedback and suggestion	20	39	1.95	
14	Top Management Support	20	54	2.7	
15	Customer feedback & suggestion	20	26	1.3	
16	Frequent and Reliable Service	20	30	1.5	
17	Customer Satisfaction	20	41	2.05	
18	Customer Awareness	20	23	1.15	
19	Multifunctional workers	20	25	1.25	
20	Standardization	20	34	1.7	

Table 1.2 indicates that Location of Industry has got the maximum value (i.e. 56), hence is the most difficult element of VMI for Top Management Support 54, as mean score, which is second most difficult element of VMI whereas, Customer Awareness has got 23 as mean, which is the least one, hence it can be termed as least difficult in manufacturing industry.

From Table 1.2, other most difficult elements are Effective Communication between Industry and customers , Job satisfaction , Standardization , Team Work , Frequent and Reliable Service, Organization Policies, Customer feedback & suggestion, Multifunctional workers, Employee Training, Customer Awareness

3.4 DATA ANALYSIS:

Analysis of the data has done with the help of the XY Scatter Chart which is drawn between importance as abscissa and difficulty as ordinate. The axis crosses at their relative value of population mean (μ) i.e. for X axis it is 40 and for Y axis its value is 40. In figure , the lower right quarter i.e. Part-1 shows those elements of VMI which are Less important and are more difficult to implement. The upper right quarter i.e. Part-2 shows those elements which are highly important but are more difficult to implement. The upper left quarter i.e. Part-3 shows those elements which are most important and less difficult to implement in industry.

The lower left quarter i.e. Part-4 shows those elements which are less important but are easy to implement.

CONCLUSIONS

On the basis of a survey of 20 Manufacturing industry, mean was calculated for different elements of VMI on 0-80 scale and all the elements were analyzed and plotted on a scatter chart, from where most important and less difficult elements were found out. A comparison of extent of importance and difficulty of VMI elements was carried out. The most beneficial elements for the surveyed were also found out. It is suggested that VMI elements should be implemented in a phased manner and after conforming its success, it should be implemented to the whole process. First of all one should implement the most

important and less difficult elements to the critical processes only as a pilot project. The most important and highly difficult elements should be implemented after the successful implementation of the pilot project.

Table 1.3 Elements Which Are Important As Well As Easy To Implement

S. NO.	ELEMENT	VALUE OF MEAN FOR IMPORTANCE (0-40)	VALUE OF MEAN FOR DIFFICULTY (0-40)
1	Organization policy	74	27
2	Standardization	73	34
3	commitment	70	38
4	Job satisfaction	69	35
5	Frequent and reliable service	68	30
6	Employee training	64	24
7	Employee feed back and suggestion	63	39
8	Effective communication between industry and customer	62	36

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