CHAPTER 9
VENDOR MANAGEMENT FRAMEWORK FOR KNOWLEDGE MANAGEMENT SOLUTION IMPLEMENTATION

9.1 INTRODUCTION

Organizations all around the world have woken up to the fact that in order for them to successfully compete in the international markets and to sustain their competitive advantage, they must strive to imbibe and rely on effective supply chains and networks. The management of the supply chain has thus caused a paradigm shift in the way most organizations function (Brandt 2009). Companies are seen to now focus on their core competencies and rope in external suppliers, distributors and logistic providers in order to ensure that products are manufactured and delivered as per the demands of their customer (Zammori et al 2009). Hence it is imperative that there should be a close cooperation between the various members who constitute a part in the supply chain.

Vendor Managed Inventory (VMI) is one of the supply chain practices in the industry that helps bridge the gap between members of the supply chain and ensures a deeper integration and collaboration among them (Dresner et al 2009; Disney and Towill 2003a). VMI, also popularly referred as continuous replenishment or supplier managed inventory, is a strategy based on principle that the manufacturer or supplier assumes the responsibility for the management as well as all decisions regarding the product inventory at the customer by utilising the demand information obtained from the customer
(Zammori et al 2009; Claassen et al 2008; Chopra and Meindl 2007; Waller et al 1999). Flow chart of the processes involved in VMI is detailed in Figure 9.1 (Sari 2007).

Figure 9.1 Flow Chart of the Processes Involved in a VMI System
The globalization of the supply chain has spurred the growth of VMI. The concept of VMI was pioneered based on the belief that suppliers would be better equipped to handle the customer’s inventory due to their adept knowledge in estimating lead times. Accurate and timely information about the expected demand and inventory levels from the customer enables the suppliers to plan production and delivery, preventing stock-outs, improving the visibility of stocks and reducing inventory costs (Leung et al 2009; Croson and Donahue 2005). Implementing a VMI therefore discards one echelon of forecasting demand and ordering, dampening the bullwhip effect and eliminating disruptions in the supply chain decision making. VMI is critical for KM implementation because the involvement of external entities and external philosophical management approach will improve the effectiveness of the organization.

From the aforementioned flow chart, it can be ascertained that the retailer provides the point of sales (POS) data as well as its level of inventory to the vendor/supplier. This information is processed by the supplier to determine the order amount based on the predetermined order-up-to level and then the supplier proceeds to ship the order to replenish the inventory (Sari 2007). With the removal of one echelon, the inventory cost and total supply chain cost is reduced and the customer service level is enhanced (Michaelraj and Shahabudeen 2009; Belcher 2008).

9.1.1 Benefits for Suppliers

- **Proactive response and alignment of the production** – The VMI system allows the supplier to take over the reins of production planning and stock replenishment for the customer. Information on the demand forecast and existent demand is conveyed to the supplier and this
enables them to be proactive and align and plan their production process to replenish stocks (Sari 2007).

- **Reduction in transportation cost** – Implementing VMI enables the suppliers to plan the replenishment schedule and ensure the products are dispatched utilising the full capacity of vehicles and hence saving on transportation costs (Claassen et al 2008).

- **Lower Inventory costs** – With the clear and precise demand forecast availability, the supplier are able to reduce their inventory carrying cost as the need of keeping large amounts on inventory as safety stock is eliminated (Saxena 2009).

- **Ease on promotion of newer products** – With suppliers owning the inventory at the customer’s premise, it become easier for them to introduce new products into the market and avoid the general hesitancy shown by retailers in keeping large amount of newly introduced products under their stocks as the demand for it is unknown (Croson and Donahue 2005; Mishra and Raghunathan 2004).

- **Ability to meet changing demands** – With proper demand forecasting, vendors in a vendor managed system can respond better to changing markets by gauging changing demand patterns (Dong and Xu 2002).

- **Strong and long lasting relationship across the supply chain** – The suppliers in the VMI system can be ensured to achieve a strong and long lasting bond with the retailers or end users and reduce the rate of defection from them (Zhao et al 2009; Classen et al 2008).

### 9.1.2 Benefits for Retailers

- **Elimination of stock out issues** – With the supplier taking over the management of the inventory and the timely demand forecasts, the chances of a particular product being out of stock at the retailer’s premise is slim (Classen et al 2008).
- **Reduction in administration costs** – Implementing a VMI system helps the retailers to avoid voluminous material planning and backorders, thereby reducing administration costs (Sari 2007).

- **Reduction in lead time** – Quite obviously, with the vendor managing the inventory and handling the replenishment decisions, the lead time for the product to reach from the vendor to retailers is reduced by a great extent (Wang and Ru 2009; Claassen et al 2008).

- **Optimum use of space** – Timely replenishment of stocks by the vendor at the retailer’s premises prevents buildup of excess inventory which takes up space in the retailer’s premise (Carbone 2009; Waller et al 1999).

- **Simplified Procurement Process** – Extensive material requirement planning (MRP) can be avoided by the retailer in a VMI system, as demand forecasts and actual demand is being relayed to the vendor in order to replenish the inventory (Dresner et al 2009).

- **Reduction of Obsolescence** – In a VMI system, the vendor is able to gauge the demand patterns and ensure that the right amount of stocks are replenished preventing obsolescence of products not sold (Sari 2007).

### 9.1.3 End User Benefits

- **Improved availability of products** – Using a VMI System ensures the chances to stock out at the retailers are reduced to a great extent and end users are assured of stock availability when they require it (Xu and Leung 2009).

- **Reduction in switching cost** – Lack of availability of products decreases affects longevity of a loyal customer and increases the rate of defection. However, the end user might have to succumb to higher
switching costs. This can be avoided in a VMI system (Ramakhyani 2009).

9.1.4 Benefits for the Entire Supply Chain

- **Minimisation of the Bullwhip Effect** – The ability of the vendors in the VMI system to gauge the actual demand information and demand forecast from the retailer ensures that both the retailers and vendors do not end up with excessive variability in the production and excessive inventory. Thus in effect, the VMI system plays a pivotal role in the reduction or minimisation of the bullwhip or whiplash effect (Croson and Donahue 2005).

- **Error reduction** – The robust information systems used for the VMI system helps to arrest losses occurring due to human error in data entry. (Zammori et al 2009; Vigil 2007)

- **Improvement in the processing speed** – The ability of the vendor to receive demand forecasts and the current inventory level on a real time basis, allows them to replenish the inventory without a loss of time and thus improve the processing speed in the entire supply chain and improve lead times considerably (Claassen et al 2008; Dong and Xu 2002).

- **Lower cost for Inventory and Transportation at the supply chain level** – As seen earlier, the VMI systems helps in reduction of inventory costs and transportation costs of the vendor. This reduction in costs translates to a reduction in costs at the supply chain level by making the supply chain lean (Zammori et al 2009; Gentry 2008).
9.1.5 Major Limitations and Risks in a VMI System

In the previous section, the VMI system was seen to have a large number benefits for the supplier, retailer, end users and the supply chain in general. However, the implementation of a VMI system also poses numerous challenges and risks. Listed below are some of the major limitations and risks seen to be in a VMI system.

- **Substitution of Products** – Chopra and Meindl (2007) ascertains one of the major limitations in the VMI system is the threat of substitutes of products in the mind of the customer. This was illustrated by taking an example of a detergent manufactured by P&G and a detergent manufactured Unilever. A retailer implementing VMI for both these suppliers might cause the suppliers to neglect the impact of substitution and thereby resulting in an incorrect inventory level.

- **IT Infrastructure Cost** - Implementation of a VMI system might require the use of a robust EDI, ERP software’s such as SAP, i2 and Oracle or data tracking devices such as RFID and Bar Code scanners, which are considerably quite expensive to test, setup and maintain (Vigtil 2007).

- **Management of change** - VMI implementation will bring about major changes in the organization and its processes as the vendor now takes over the inventory management and replenishment. The resulting changes have to be permeated across all the employees in the organization and therefore management of change is a crucial factor in the implementation of VMI (Michaelraj and Shahabudeen 2009)

- **Loss of flexibility** – With the implementation of a VMI, retailers now would be forced to notify suppliers well in advance incase they plan to have special sales events and promotions. This needs to be done so that the suppliers can incorporate the new requirements when deciding on
the replenishment schedules. This results in the loss of flexibility for the retailers (VMI 2009; Claassen et al 2008).

- **Threat of forward integration by supplier** – Having the vendor manage the retailer’s inventory results in the vendor gaining information of the demand forecasts, actual demands, demand cycles, optimum inventory levels, sales strategies of the retailer’s results in the looming threat of forward integration by the supplier. (Disney and Towill 2003).

- **Vulnerability to unforeseeable events** – Implementing a VMI system would mean vendors would try and achieve optimum levels of inventory at the retailer’s premise. However, this would address unforeseeable events such as calamities requiring more stocks with the retailer (VMI 2009).

- **Dependency and trust issues** - A trustworthy relationship between the supplier and retailer is imperative for the success of a VMI system. A slight hindrance in the relationship can result in the disruptions of the inventory levels and the entire supply chain (Wang and Ru 2009). Chances are high for retailers to feel that they are being coaxed into holding stocks of the vendors’ products only (Carbone 2009). Retailers will also end up with much higher switching costs when they have to switch to other vendors (Brandt 2009).

- **Loss in shelf presence** – Maintaining lower levels of inventory of a particular product, under a VMI system, would at times result in the product going unnoticed by a end user on the shelf and the likely chances are that the user might get attracted to products not under the VMI system due to its shelf presence.
9.1.6 Key Issues in Design and Implementation of VMI

The design and implementation of a VMI system cannot be done overnight. It is imperative for organizations to understand that any VMI implementation process needs to be approached in a phased manner. The various phases in the design and implementation of this system are depicted in Figure 9.2.

Figure 9.2 Implementation phases in a VMI system
Phase 1 – Open Communication: There should be an open communication channel always between suppliers and retailers on what each entity’s strategy, goals, targets and objectives are when being considered to be part of the VMI system (Zammori et al 2009).

Phase 2 - Information Sharing: As seen earlier, information is one of the key elements in the VMI system and accuracy of the transmission will play a pivotal role in the success of this system. Suppliers and retailers should therefore reach a consensus to provide accurate information for each other (Vigtil 2007).

Phase 3 - Reliable information receipt: Vendors receive demand forecasts, actual demands and inventory level updates from the retailers. The use of this information should be primarily to handle the retailer’s inventory by the vendor and therefore the vendors should agree and work on being extremely cautious and reliable with the receipt and use of the information received. Retailers also should ensure that the information transmitted should unarguably be reliable. (Vendor Managed Inventory 2009; Vigtil 2007)

Phase 4 – Order policy and risk share: The supplier and retailer should come to a consensus on the minimum order point, maximum level of inventory and safety stocks. It is also important to reach an agreement on the sharing of risks in the event of stock outs or obsolescence. Similarly agreements on the sharing of rewards should be predetermined between the supplier and retailer.

Phase 5 – Resource allocation: The setup and implementation of a VMI system requires a huge commitment of resources from both the suppliers and retailers. Personnel from both the retailers and vendors should use their skills, talents, abilities and knowledge and work together using a robust IT infrastructure and to design the VMI system (Ramrakhyani 2009; Vigtil 2007).
Phase 6 – Pilot runs and adjustments: Before the execution and implementation of a full fledged VMI system, ample pilot runs should be conducted to iron out the flaws and make changes and necessary adjustments in the system.

Phase 7 – Implementation: The final stage in VMI system is the final deployment and implementation where the inventory monitoring, planning and management and replenishment decisions will be taken over by the vendor so as to reap all the benefits described in the earlier section for the vendors, retailers, end users and the total supply chain. However, the system should be open for continuous improvements and adjustments so that the vendors and retailers can be ready to tackle the ever changing markets (Zhao et al 2009; Chen et al 2009).

Apart from the above steps in the design and implementation of VMI system in an organization, the management should also wake up to the fact that they should put in a considerable effort to help employees adapt to the changes in their environment when this new setup is brought into practice. Appropriate change management processes and procedures need to be in set up for the benefit of the employees and the organization (Kiesmüller and BroeKMeulen 2009).

9.2 RESEARCH GAP BASED ON LITERATURE

The need for having a holistic VMI framework and evaluation for organizational transformation is highlighted in literature. It is also clearly evident that the systematic VMI approach and model is a key for any organizational change like KM. From the detailed literature survey the research gap is shown in Figure 9.3.
9.3 RESEARCH PROCESS AND METHODOLOGY

The research process and methodology cannot be generalized for this research gap. This is purely based on the individual organization and the basic process and methodology can be developed. From the basic process and methodology, the organization should develop and customize based on their specific requirements. The basic process and methodology is detailed in Figure 9.4.
Figure 9.4 Research Process and Methodology

9.4 CASE STUDY DEMONSTRATION

Concepts like Supply Chain and Vendor Managed Inventory are receiving considerable attention today when business are struggling globally. Many organizations have realized the enormous benefits that can be gained by introducing these functions. The concept of supply chain in business promises
benefits like reduction in working capital, optimization of resources across various entities of the chain. There are many innovations exists in order to improve the effectiveness of supply chain like Vendor Managed Inventory, Point of sales, Collaborative Planning Forecasting and Replenishment etc.. Vendor managed inventory become the popular and a powerful tool to remove cost from the supply chain in its practical applicability. It is a streamlined approach to inventory and order fulfillment and is a system in which a vendor continuously and automatically replenishes a trading partner’s inventory. True VMI occurs between a distributor/customer and a supplier/manufacturer, with Electronic Data Interchange (EDI) being the crucial link between the two companies. For any business to survive in this competitive environment it is necessary to understand the various process and it should be mapped in such a way to design the supply chain as per requirements. Identifying reasons for the gap between the entities in the channel and designing a system to improve the performance of the channel by reducing the gap since TRUST is considered to be the critical ingredient in the successful VMI alliance. The single most important benefit of engaging in a strategic VMI alliance could be the chance for cultivating a strong and lasting relationship between the vendor and the distributor, which in the long run can reap rich rewards for both. The scope of the research with regard to Corporation X is as follows:

- Study the existing Vendor Managed inventory system between the company and its supplier.
- Identify the level of demand requirement met by the existing system
- Point out the problem that affects the performance of the existing system
- Propose a new model to overcome the problems in the existing system

9.4.1 Corporation A Group

The Corporation A Group, with a turnover of over one billion dollars, is the largest manufacturer of automotive components in India. The
group produces auto-electrical, diesel fuel injection systems, braking systems, automotive wheels and axle fasteners, powder metal components, radiator caps, two wheelers and computer peripherals. Backed by five service and distribution companies with an extensive network across the country, the group has the largest distribution network for automotive products in India.

9.4.2 Corporation X

Corporation X was set up in 1961 as a joint venture of XX Industries to manufacture Automotive Electrical Systems. The company designs, manufactures and supplies advanced technology systems, products and services to the worlds automotive, after market, diesel engine and aerospace industries. The combination of these two well-known groups has resulted in the establishment of a vibrant company, which has had a successful track record of sustained growth over the last three decades. Corporation A is one of India's twenty large industrial houses with twenty-five manufacturing companies and a turnover in excess of US$ 1.3 billion. The turnover of Corporation X and its divisions is US$ 233 million during 2003-2004. Incorporating the strengths of XX and the Corporation A Group, Corporation X has emerged as one of the foremost leaders in the automotive industry today. Corporation X reaches out to all segments of the automotive industry such as passenger cars, commercial vehicles, tractors, jeeps, two-wheelers and off-highway vehicles as well as for stationary and marine applications. With the automobile industry in India currently undergoing phenomenal changes, Corporation X, with its excellent facilities, is fully equipped to meet the challenges of tomorrow. Corporation X manufactures the most comprehensive range of auto electrical components in the country. A range which continues to set standards in the industry. The products are designed to meet the demands of vehicle manufacturers both in India and worldwide. With the emission
standards in India becoming increasingly stringent, Corporation X has ensured that each of its products is manufactured to meet global standards.

9.4.3 Quality Assurance

"Corporation X is committed to achieving ever increasing levels of customer satisfaction through continuous improvements to the quality of the products and services. It will be the company's endeavor to increase customer trust and confidence in the label 'Made in Corporation X.'"

Quality is no longer an option but a basic requirement in today's world. At Corporation X, quality is inbuilt in every phase of manufacture. The company's quality assurance measures stand on the foundation of a solid belief - that quality begins and ends with the customer. This commitment forms the backbone of its approach to Quality Assurance. Corporation X has adopted a prevention-oriented quality policy though ingrained with the traditional ideas of quality control. Everyone from the highest levels of the organization to the lowest practise quality control both as an individual and as a team. An effective Quality Control System has resulted in the recognition of the company's outstanding achievements in the various fields. Corporation X was awarded the ISO 9001 certified by BVQI in December 1993. The company reached a further milestone when it recently received a certificate of recognition from BVQI for QS 9000 for Auto Electricals.

9.4.4 Study of Existing VMI Model

Corporation X existing VMI model is not well established and not so extensive. The company is trying to develop a well coordinated model of working. RASIS is the company owned software. This software is programmed in such a way it can calculate the Bill of materials(BOM) and it is connected with the supplier’s. Corporation A is known for its Quality. It had received DEMING’S Quality award in 2004. So in order to maintain the
quality standard it has a well established buying group called Y buying group. This group will decide the raw material prices as per the market situation. Supplier’s can procure from the approved raw material supplier at the rate fixed by Y buying group. The logistics service for Corporation X is done by Z Logistics for almost 90% of the materials. Their duty is to collect Delivery Indent(DI) from Corporation X to Supplier and material from Supplier to Corporation X. In some cases for 10% suppliers manage their own logistics. Corporation X has a supplier development cell. They will monitor the supplier way of working, their method of procurement. They will even check whether they are procuring materials from authorized person. They will insist all suppliers to plan for their 100 PPM implementation. For new suppliers they even plan their layout as per Corporation X expectation. The study of existing system is based on the interviews with 70 executives in the organization.

9.4.5 Existing Model at Corporation

The existing model at corporation is explained in detail:

- Purchase department will send all supplier’s a plan for every three months to procurement planning of suppliers.
- Marketing will inputs the demand requirement in RASIS. This will be done every week.
- RASIS will calculate the BOM and it will send indication to the respective vendors.
- Suppliers will plan for their production for that week with the help of RASIS.
- DI will be sent to every supplier daily morning.
- Material will be received from all the suppliers only as per DI schedule, irrespective of requirement given through RASIS.
- As soon as the material is received it will be sent for BARCODE scanning.
- Than the material is moved into the factory.
9.4.6 Problems in Existing VMI Model

The problems in existing VMI model are identified based on the interviews with 70 executives in the organization and are detailed:

- The three month plan given by Corporation X, weekly schedule through RASIS, and DI given through Z Logistics differs a lot. This will create a huge problem in Supplier’s end.
- Their requirement has a huge distortions and the compensation is not barred by Corporation X.
- Critical situations:
  
  **Case 1:** Weekly Schedule is less than DI, hence supplier can’t able to meet the demand for which he has to pay for shortage of material.
  
  **Case 2:** Weekly schedule is more than DI, which make him to carry his inventory.
  
  **Case 3:** DI will be asked for a material which is not given in the weekly schedule or sometimes DI will be asked for material which is supposed to be given the next day as per weekly schedule.

- So in all the three cases suppliers are affected a lot. But when we look at the company point of view, if there are X components required for producing a item A, and if 1 component is not supplied i.e. if one supplier is not supplied, whole production will stop. So in order to avoid the termination of production, the company is forced to look for an alternative product which can use the remaining item or by modifying the remaining item. This becomes the root cause of some of the problem.

- This kind of change in production plan creates the immediate requirement of some of the items, for which supplier has to bare the logistics activity.

- Apart from the above mentioned points, the survey analysis also shows that the suppliers are not protected as they expect. Suppliers are asked to buy raw materials only from those prescribed by Corporation X. When there is an increase in price of raw material suppliers are asked to pay the increased
amount to raw material supplier but they are not paid for that price increase from the company.

- Corporation X not only a customer to its suppliers but also a supplier to some of its supplier.
- In some cases the company itself failed to supply the raw material to its supplier, so the supplier cant able to meet his requirement but the company ask the supplier to for it.
- The survey analysis also depicts that the company is not transparent to its suppliers which is an important factor for establishing VMI.
- Though suppliers are finding lot of problems, they are also creating problems like increase in number of returns, improper response to the software system.

9.4.7 Key Findings from the Study

The key findings from the study are detailed:

- From analyzing all the problems in the system from supplier’s view and also from company’s view, the key cause becomes lack of information sharing which results in lack of coordination.
- If we look closely into the problem, in certain situation the change in production plan is created by one supplier, because of his inefficiency of delivery Corporation X is forced to change the plan, which creates problem for all other supplier’s. The point to note here is the inefficiency in delivery is not by one supplier always, this mistake is done by all suppliers; even some good suppliers commit this mistake, so the company is not in a position to reject any supplier because of this problem.
- The analysis clearly points out the problem with the software, when the marketing department inputs the demand, BOM is calculated and the suppliers are intimated as per the demand requirement. That demand requirement dint includes the inventory information.
• Example: Alternator model SM4. Consider each alternator requires one fan.

• Marketing Input: 220

• So software will intimate the fan supplier as 220 but the company has already 60 fans in hand i.e. as inventory, that detail is not updated. This will put supplier in trouble.

• The software used by the company RASIS is updated once for a week, hence suppliers are not in a position to predict the day to day activity.

• The responsibilities and ownership of the suppliers is very week in the present working system.

• This system involves huge paper work on both the company and supplier’s side.

• Cost involved in communication is very high in the current system.

• Not only the cost but the time involved is also abruptly high.

9.4.8 Different Methods of Information Sharing

Uncertainties in the supply chain usually results in inventory. So in order to reduce the inventory it is necessary to identify the uncertainties. The reason for uncertainty is the lack of information sharing. Every single member has perfect information about himself; uncertainties arise due to a lack of perfect information about other members. To reduce uncertainties, the supply chain member should obtain more information about other members. If the members are willing to share information, each of them will have more information about others. Therefore, the whole system’s performance will be improved because each member can gain improvement from information sharing. This cooperation mode for increasing information sharing among supply chain members can be called a supply chain partnership.

A supply chain partnership is a relationship formed between two independent members in supply channels through increased levels of information sharing to
achieve specific objectives and benefits in terms of reductions in total costs and inventories. It promises a win-win situation for the members involved. The partnerships are focused on the basis of different methods of information sharing (Figure 9.5) between two adjacent partners on the chain. The average inventory level in all the three methods of a typical case study from the literature are graphically shown in Figure 9.6.

Method 1: This is referred to as "decentralized control". The inventories at different sites of the supply chain are controlled independently. There is neither information sharing nor any ordering coordination between the manufacturer and the supplier. Both the manufacturer and the supplier make their inventory decisions according to their own forecasting. The manufacturer uses the customer demand information and the supplier uses the manufacturer's ordering information. We suppose both of them use the base stock policy as their inventory control policy. The base stock policy is of the type with periodic review procedures, which means an order will be placed to replenish the stock level to $S$ at each time period if the stock level is less than the reorder point $s$. $S$ is called the order-up-to level.

Method 2: It is referred to as "coordinated control". The two neighboring inventories are coordinated with sharing of the customer ordering information. In this situation, the supplier will obtain the customer demand information, together with the manufacturer's ordering information, and then make its inventory decision based on both the current customer demand information and the manufacturer's ordering information.
Figure 9.5 Method of Information Sharing
Method 3: This situation is named as "centralized control". Under this situation, the decentralized supply chain can obtain the optimal performance achievable by a supply chain under centralized control. Based on EDI, both the manufacturer and the supplier can retrieve the customer's demand information in a synchronized manner. VMI can be adopted. This means the supplier takes the initiative to make major inventory replenishment decisions for the manufacturer in parallel with its own inventory decisions. In this case, the supplier will not depend on the manufacturer's ordering information, but on the customer's demand directly.

Pareto improvement implies that all members in a system are at least as well off, and some members are better off. From the comparison results of inventory reductions and cost savings of the supply chain members
under the three relationship integration levels, it is clear that the supplier can obtain proportionate benefits with an increasing level of information integration. Under the supply chain partnership with information sharing, both the supplier and the manufacturer are at least as well off, and at least one of them - the supplier/manufacturer - is better off. The partnership can improve the overall performance of the supply chain. Pareto improvement can be achieved in respect of the overall performance of the supply chain. The method 3 is chosen for this case study organization based on the interviews with 70 executives in the organization.

9.4.9 Design of VMI - Five Step Process

A five step process is designed based on the Delphi analysis to get its VMI program up and running for direct materials. The flow chart is designed after 3\textsuperscript{rd} round and is detailed in Figure 9.7.

<table>
<thead>
<tr>
<th>Identify suppliers</th>
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<tbody>
<tr>
<td>Determine which parts cost the most to manage</td>
</tr>
<tr>
<td>Get suppliers to include part numbers</td>
</tr>
<tr>
<td>Determine target inventory levels</td>
</tr>
<tr>
<td>Establish and label a fixed location for each item</td>
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Figure 9.7 Five Step Process for Design of VMI
Five steps to implement VMI are detailed:

- The *first step* involved identifying suppliers that had the capabilities and willingness to engage in VMI. Selection of suppliers should be based on their proximity to their manufacturing plants, as well as their ability to understand customer’s goals and processes, including the macro planning data that customer uses to do their own planning internally. (All of the suppliers in the program are located within an hour of the plant they supply, and can get a representative to the plant at least once a week.)

- In the *second step*, customer should identify the parts from the suppliers that would be good candidates for VMI, focusing first on items with the most frequent deliveries and low value, which cost customer the most. These were items with low risk from a cost standpoint. For example, the process for planning, scheduling and receiving a component was as long as the process for items that cost only a penny or two. "It is better to look for commodities that are repetitive and are provided by a supplier located nearby, and that could be visually managed."

- The *third step* involved the company and suppliers finalizing the part numbers.

- In the *fourth step* is determining order and delivery frequency as well as target inventory levels, including standard Kanban quantities and types of returnable containers that can streamline processes. Kanban container quantities were based on the rate of consumption and the time required replenishing an empty container.

- *Fifth*, the company should establish and label a fixed location for each item, as close to the point of consumption as possible, so that the workers would be able to access parts as needed.
9.4.10 Activities Involved in Implementation Process

The supplier representatives should come into the plant as many as three times a week to check bins, slots or cells, and do replenishment. The representative visually checks stock levels and checks off material required to replenish the fixed location. The triggering mechanism for reordering can be an empty Kanban container, an empty rack, or an empty location, depending on the part being checked. When items are shipped, they are marked "VMI" by the supplier so the receiving department knows that they are part of the VMI program. To aid in long-term planning, the customer provides VMI suppliers with its macro planning data, e-mailing to them a rolling 12-month demand projection once a week.

For Customer, the benefits of VMI are numerous:

- It's eliminated manual planning and scheduling for all material in the program.
- All material has a fixed and visible location, which the supplier manages, reducing the time to locate material.
- The program eliminates receiving transactions for incoming materials and eliminates the need to maintain delivery information, since the supplier is responsible for proof of delivery information.
- It has also streamlined the company's accounts-payable activities by eliminating the purchase-order/receipt-matching process, and consolidating invoices.
- Most importantly, the program has eliminated a number of stock outages.

9.4.11 Benchmarking VMI

VMI programs can reduce inventory by 70% and increase revenue by 100%, and the IT investment needed is smaller than you may think. Typical metrics used by the companies to measure effectiveness of the program included:
- Fill rate
- Inventory turns
- Lead-times
- Performance
- Demand variability
- Data feed timeliness and accuracy

9.4.12 Supplier Segmentation

If Vendor Managed Inventory (VMI) implemented properly, there is the potential for a great partnership that will yield immense value for both the customer and the vendor. However, if one party goes into a VMI engagement thinking they will be the sole winner, the probability of success is greatly diminished. As it is a fact that the termination of any type of partnership can be expensive and, to use an all-encompassing term, messy. VMI is a relationship where the customer's inventory levels are monitored and replenished by the vendor, based on a service contract. This must be a contractual relationship set up with the intent of protecting the interests of both the customer and the vendor. The items that need to be defined in the contract include: demand forecast and consumption methods and timing; the length of the contract term; prices and annual quantities of products covered by the contract; implementation methods and timing; invoice payment terms; service levels and penalties; termination methodology; quality methodologies; and any engineering change notification/timing methods that need to be employed. But implementing VMI immediately with all suppliers is a difficult task. So it is very essential to identify the potential suppliers or to segment the suppliers. The following model will illustrate the method of segmenting the suppliers.
9.4.13 Empirical Model of Supplier Segmentation

The model consists of two dimensions that underpin a VMI relationship strategy towards suppliers, namely:

- The supplier's commitment to VMI
- The commodity's importance to VMI

Each dimension is divided into two categories referring to a high or low degree of the supplier's commitment, and a high or low degree of the commodity's importance, to VMI. The generic model of supplier segmentation consists of four principal relationship strategies emphasising the supplier's commitment, and the commodity's importance, to a VMI. Each relationship strategy has its own characteristics and expectations from a VMI point of view in terms of supplier selection criteria:

- A transactional relationship strategy signifies that the manufacturer invests limited resources in this specific supplier relationship and in VMI. The supplier delivers only single and simple components. This relationship strategy is characterised by low mutual commitment, alternative supplier choices available, and often price-driven transactions.

- A friendly relationship strategy signifies that the manufacturer continues to foster a strong relationship in this specific supplier relationship. The supplier is considered as a partner to manufacturer. This relationship strategy is characterised by the supplier being dedicated to the VMI in fact often dependent on the manufacturer, while the supplier is not so innovative.

- A business partner relationship strategy signifies that the manufacturer maintains a high level of competition between this supplier and others. The supplier is one of the larger ones that deliver to the manufacturer. This relationship strategy is characterised by the fact that the supplier is usually a market leader, significant buying amounts are involved, and the supplier has a range of product offerings.
- A family relationship strategy signifies that the manufacturer invests resources in VMI in this specific supplier relationship and also develops strong corporate partnership with this supplier. The supplier is one of the principle ones to the manufacturer. This relationship strategy is characterised by commitment to mutual success between the manufacturer and the supplier, strategic for technology advancement, critical to the manufacturer cost success, and important to the brand of the manufacturer.

- The three steps of flow of implementation are detailed in Figure 9.8, 9.9 and 9.10.

```
Family ➔ Friend ➔ Business ➔ Transaction
```

**Figure 9.8 Implementation Step 1 of Supplier Segmentation**

<table>
<thead>
<tr>
<th>Commodity’s Important to VMI</th>
<th>Supplier’s Commitment to VMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Family</td>
<td>Low</td>
</tr>
<tr>
<td>Business partner</td>
<td>Friendly</td>
</tr>
<tr>
<td>Transactio nal</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 9.9 Implementation Step 2 of Supplier Segmentation**
Figure 9.10 Implementation Step 3 of Supplier Segmentation

9.4.14 Customer Business Processes

The customer must have some method of communicating demand and consumption with the vendor. This may be a situation where the customer regularly sends a forecast of demand via EDI or B2B Internet communications and then also updates actual consumption and stock adjustments in the same manner. Alternatively, there may simply be an annual contract in place with onsite replenishment taking place on a pre-determined basis. This is quite effective in manufacturing environments where standard products are used in multiple floor-stock locations. There can also be a combination of demand/consumption methods and purchase committal dates that are typically defined at the product level. Whatever situations exist, the methodology and timing must be documented in the agreement.
In order to manage the contract automatically, the customer should have Contract Purchase Order functionality in their ERP system. This functionality includes the ability to maintain: the start and end dates of the contract; the annual quantities expected and the price per unit of measure for each product contracted; the release mechanism for each product (e.g., forecasted, order point, etc); the agreed-upon service level or reorder point; the stock authorization type (e.g., approval or automatic); the payment terms; cancellation criteria; stock-out penalty info and capture of incidents; and, whether all, any or none of the products are QAS (Quality-At-Source) certified. QAS is a methodology in which customer and vendor share information that allows the vendor to pre-inspect material to the customer's specifications prior to shipment to the customer.

The purchase order system must also be able to accept multiple receipts against the one order, and track the receipts by part number when there are multiple parts covered by the VMI contract. A work-around is that you have one contract purchase order for each part number covered. The downside is the number of orders that need to be maintained and the amount of work required to set them up.

The performance of both the vendor and the customer needs to be monitored through reports from the purchasing system. Obviously, the vendor performance measures are on the ability to maintain stock levels per contract and the quality of product, etc. However, the purchasing system should be integrated with the accounts payable system and be able to monitor the on-time payment of invoices so that the customer can readily show compliance to invoice payment terms. Additionally, the purchasing system should be able to flag the buyer when consumption of product either exceeds or lags behind forecasted demand levels. The customer should also undertake cycle-counting the product receipts as an audit of compliance.
9.4.15 Vendor Business Processes

Dependent upon the types of communication agreed upon for demand forecast and consumption, the vendor must be able to receive and process the information in the same format as the customer. The interesting part is that not all ERP solutions can differentiate demand forecast by customer. However, this is a function that is essential to tracking forecast deviations, planning replenishment and potentially tracking 'commit to buy' aspects of the supply contract. The customer order system must have all of the same elements as the corresponding contract purchase order system. If the customer order system is not able to track multiple shipments against multiple lines, then multiple sales orders are going to be raised against a single customer purchase order. The lack of multi-line customer order contracts with multiple shipment capabilities will complicate reporting requirements. The customer orders must also be integrated to the quality system should a QAS environment be required. In most QAS environments, a Certificate of Compliance or Certificate of Analysis is required with each shipment.

9.4.16 Proposed VMI System and Necessary Steps for Implementation of VMI

The proposed VMI system and the necessary steps for implementation of VMI are derived based on the results of 3rd round of Delphi analysis.

Step 1: Top Management must commit to the process. Their support is vital. They must commit to the factors like costs involved, manpower needed for setup/maintenance and also the concept of having someone else manage their inventory.
**Step 2:** The employees should adopt themselves to this new concept. Without their acceptance, the VMI program cannot take off. 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.

**Step 3:** Synchronize the customer’s product files with the supplier. This step alone is one of the greatest benefits you will receive from VMI. This is done by establishing new ERP software with all required information. Synchronizing means that you must match the supplier's product data with the distributor product data. Are there old, obsolete items on the file? Have new product numbers been properly communicated to the distributor.

**Step 4:** Extensive testing of all EDI sets to be used. The supplier and distributor/customer 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 supplier match the quantity on hand in distributors stock? EDI testing may take many tries and adjustments before its finalization.

**Step 5:** The distributor/customer must understand and agree with the Stocking Plan the supplier 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/customer should also monitor their current performance for comparison to later results. Both parties must agree upon the frequency of replenishment (daily once/twice per week).
**Step 6:** The distributor/customer sends the supplier his Point of Sale history file, usually 1-2 years (Disk or Email). The format of the file must be compatible to the needs of the supplier. Then the distributor sends an EDI indicating the product movement. This tells the status and stock level of every item they have. Both sets of data have to be verified. This is the last and most important validation point.

**Step 7:** Distributor/customer should use the item and enters that transaction into the computer.

**Step 8:** On a daily/weekly basis the distributor/customer sends an Product Activity.

**Step 9:** The supplier receives the material movement information, demand requirements and updates the distributors Stock Plan. Once an Item or Items have hit their Reorder Point (ROP), the supplier creates an order.

**Step 10:** The supplier electronically generates a Purchase Order to the customer. During the beginning of stages of the VMI partnership, it is important to have the periodic reviews at both the ends to point out any problems.

**Step 11:** The supplier picks and ships the order and transmits a Delivery Notice. When the shipment is received, the customer transmits a Material Receipt Notice (MRN). This tells the supplier exactly what was received. The supplier can then match this to his Purchase Order to determine any potential problems (mis-shipped etc)

**Step 12:** The Invoice is sent out via an electronic billing. Payment is done through Electronic transfer of fund (ETF).

The flowchart for the proposed system is detailed in Figure 9.11.
Key parameters for implementing ERP

Demand Input in ERP

ERP will analyze BOM

ERP will indicate demand to approved vendors

Vendors able to calculate the current demand by combining both RFID and ERP

ERP will enquire vendor capacity

After capacity calculation, Customer will place a purchase order

After clearance, automated invoice generation

Delivery instruction to Z logistics by vendor

Generation of MRN (Material receipt note)

Payment instruction sends to accounts through RFID tag in accepted material

E-Payment sends to Vendor as per agreement

Figure 9.11 Proposed VMI Model
9.5 CONCLUSION

The importance of managing an organization’s supply chain and aligning the supply chain strategy with the competitive strategy of the firm has become pivotal factors in the achieving and sustaining a competitive advantage against other organizations in the same industry. The VMI is an apt supply chain practice to analyse and study. The need to attain a lean supply chain, with reduced lead times and lower levels on inventory are what most firms try to achieve. The VMI system therefore is a key supply chain practice which helps firm to achieve their goals.

The long-term success of a firm depends on the success of its suppliers and level of satisfaction of its customers. That is, the entire supply chain must be successful. VMI is the part of supply chain. What is being experienced today is a fundamental change in global business philosophy of increasing partnering arrangements. In order to manage these supply chain arrangements for realizing overall improvement in enterprise productivity, it is necessary to improve the planning and management of complex interrelated systems such as materials planning, inventory management, supplier relationship, supplier development, capacity planning, logistics, and production systems. The availability of information technologies has enabled the delivery of integrated systems for decision making.

It is important to establish strategic partnerships with suppliers for a successful supply chain. Corporations have started to limit the number of suppliers they do business with by implementing vendor review programs. These programs strive to find suppliers with operational excellence so the customer can determine which supplier is serving it better. The ability to have a closer customer/supplier relationship is very important because these suppliers are easier to work with. With the evolution toward a sole supplier
relationship, firms need full disclosure of information. They may establish a comparable culture and also implement compatible forecasting and information technology systems. This is because their suppliers must be able to link electronically into the customer's system to obtain shipping details, production schedules and any other needed information.

The proposed system integrates the supplier end with the company thereby sharing all the necessary information for the better operation of the channel. Since the proposed system is completely systematic and there is no manual process, there is a better chance of improving the channel efficiency. Though the process seems simple to implement, but in the real world of personalities and professional relationships, there are many obstacles to climb. In short, trust is very important for the VMI model to succeed. Paramount to the success of VMI is the incorporation of technological tools like EDI.

VMI partnership is a relationship formed between two independent members in supply channels through increased levels of information sharing to achieve specific objectives and benefits in terms of reductions in total costs and inventories. It promises a win-win situation for the members involved. Various suggestions are depicted for the proposed system to enhance the performance of VMI. But, the effective enhancement of VMI also depends on the nature of items and materials used in the industry. So, VMI can be implemented effectively only through stepwise improvement. The evolution of present-day market and the change in roles and power within the channel have transformed competition between firms into competition between whole supply chains. Focusing strategy on improving the performances of channel is the one and only road the firm can take to reach a greater competitive advantage. Hence the proposed system will improve the working nature and performance, but in future for continuous improvement of the system it is
better to modify the system by taking different factors like nature, cost and shelf life of the items and materials into consideration.

The future research prospects are detailed:

- Development of the conceptual VMI model for multi-stage supply chain with vertical information integration.
- Simulation, optimization and comparison of VMI model for inventory decisions with traditional system.
- Simulation of the conceptual VMI model using both periodic and continuous review policies.
- Development of a heuristic for optimizing the system parameters of inventory decisions.
- Comparison of the traditional inventory model with VMI based inventory system.

VMI is more likely to lead to higher supply chain profits if both parties commit to share precise internal accounting information and reliably transmitting, receiving, and using this information for inventory decisions (Kulp 2002).