AN ADOPTION OF VENDOR MANAGED INVENTORY IN THAILAND HEALTHCARE INDUSTRY

by

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ABSTRACT

The concept of vendor managed inventory (VMI) radically changes a traditional inventory management. With regard to the traditional concept, customers make a replenishment decision. However, the VMI concept is that the responsibility for replenishment process is allocated from the customer to the suppliers. As it requires both trading partner sharing more information; therefore, this contributes to the increasing in collaboration and integration between them. Additionally, there are advantages gained from the adoption of VMI approach: reducing lead times, increasing inventory turns, improving service quality, reducing bullwhip effect and cost. As a consequence, many companies in different industries strive to adopt this approach. However, different industries and different stages of supply chain require different types of VMI. The aim of this paper is to investigate the characteristics of VMI and then define a common practice in healthcare industry. This paper is based on literature review and multiple case studies. The previous research, supply chain management in healthcare sector in Thailand, is also adopted in order to identify the stage of the VMI approach and then find out how to develop the approach. Ultimately the model will be launched as the VMI pilot model in healthcare industry in Thailand.

KEYWORDS
Vendor Managed Inventory, Healthcare Industry, Supply Chain

INTRODUCTION

Due to the fierce competitive business environment, it has put pressure on healthcare organization to look for improving operational efficiencies and reducing cost whereas continuing to improve quality of care. Supply chain management is complex in healthcare industry because it affects to people’s health requiring adequate and accurate medical supply in regard to the patient’s need (Mustaffa & Potter, 2009). Vendor managed inventory is one of supply chain strategies to get the competitive advantage through the effective supply chain. The concept of vendor managed inventory (VMI) radically changes a traditional inventory management concept. With regard to the traditional concept, the customer makes a replenishment decision; however, the VMI concept implies that the responsibility in the replenishment process is reallocated from the customer to the suppliers. It requires both trading partner sharing more information and increasing in collaboration and integration. The integrated decision will be beneficial to improve their supply chain performance by decreasing inventory-related costs and increasing customer service. As a consequence, many companies in different industries strive to adopt this approach. However, different industries and different stages require different types of VMI approach (Elvander et al., 2007; Wallin et al., 2006). The aim of this paper is to investigate the characteristic of VMI and then define a common practice in healthcare industry. The study takes place in one of the biggest state-owned hospital. To understand the current situation, the interview and focus groups are conducted. The previous research, supply chain management in healthcare sector in Thailand, is also adopted in order to
identify the stage of the VMI approach and then find out how to develop the approach. It is hoped that the model will be launched as a VMI pilot model for healthcare industry in Thailand.

**LITERATURE REVIEW**

Vendor Managed inventory (VMI) is also known as continuous replenishment (Sari, 2007). The concept of VMI radically changes traditional inventory management. With regard to the traditional concept, the customer makes a replenishment decision; however, the VMI concept implies that the responsibility in the replenishment process is reallocated from the customer to the suppliers (Elvander et al., 2007). This approach encourages collaboration and information sharing among trading partners (Sari, 2007). Many potential advantages, gained from the adoption of VMI approach, include reduced lead times, improved service quality, reduced bullwhip effects, lower costs and reduced administration (Kauremaa et al., 2009; Elvander et al., 2007; Sari, 2007). According to this point, many companies in different industries attempt to adopt this approach. However, different industries and different stages of a supply chain require different types of VMI approach (Elvander et al., 2007; Wallin et al., 2006). The right inventory management approach for one particular item may not be the right approach for another item. Even though it is the right inventory approach for one particular item in one firm, it might not be a right approach for the same item in the other firm (Wallin et al., 2006). The challenges of VMI system implemented in different industries and at different stages of supply chain can be expected to differ. (Elvander et al., 2007; Pohlen and Goldsby, 2003; Waller et al., 1999) In this paper, we will explore the general patterns of VMI use in different industries and settings and then proposed the VMI strategy for the healthcare industry.

Demand volatility is the key problem facing various industries including retail industry. In traditional retail situations, sale fluctuations are made worse by management policies or marketing strategies (Elvander et al., 2007; Waller et al. 1999). The VMI concept provides improved visibility across the supply chain pipeline owing to the exchange of information between the retailer and the supplier (Kumar and Kumar, 2003). Waller et al. (1999) note that, with VMI, it allows suppliers to see much smoother demands signal and this permits better resource utilization for production and transportation. Electronic data interchange (EDI) is an integral part of VMI process and takes a vital role in the process of data communication. However, Sari (2007) suggests that two factors leading to failed VMI programs in retail industry caused by sharing of outdated or inaccurate sales and inventory data due in part to a lack of adequate information technology as well as a lack of mutual trust and inaccurate demand forecast.

The concept of VMI has applied to the household electrical appliances sector. According to Kuk (2004), the key to its success is good connectivity between the customer and the supplier. Electrolux group mitigated from a push flow, characterized by erroneous forecasts and high fluctuation of the demand, to a pull flow, based direct on the demand of final customers. The key element of this improved process is to exchange and sharing of data and information throughout the whole supply chain involving the suppliers upstream and sales companies downstream. Owing to this VMI approach, it has provided significant advantages including immediate response to customer’s various requirement, higher level of customer service, fewer errors, increased market visibility, improved planning, stock reduction, better management of risks and opportunities and greater sales (Toni & Zomolo, 2005). Blackhurst and Craighead (2006) proposed the single greatest barrier faced by supply chain is inaccurate data. Therefore they also mention that information sharing is a key to the successful of implementation of VMI systems.

The term VMI was introduced to automotive industry in 1990. Eagle Global Logistics, as a logistics provider, has experienced VMI beneficial for its customer. The company found that its customer achieved reductions in inventory carrying cost, improvement cycle times, reduction in transit times (Anthony, 2007). This is another area where the practice of VMI has been successfully implemented across a wide range of components. Reddy and Vrat (2007) mention that successful of the VMI model completely depends upon the co-operation between customer and supplier. Using VMI model, the customer is required to share information with the help of technology. Therefore, the incorporation of system to integrate supply chain forecast should no be overlook (Reddy and Vrat, 2007; Seldon and Affiliates, 2000). Additionally, Seldon and Affiliates (2000) suggest that, to ensure both parties gain benefit from this approach, it is essential to develop the best parameter for each VMI agreement. They suggest the key parameter to be agreed; stock quantity, stock location, standard replenishment quantity and replenishment frequency.

Regarding to healthcare industry, it is found that risks of stock out are urgent order and stock availability at the wholesaler. Due to demand fluctuation, VMI is particularly attractive to a supplier as mean to understand its own demand for supplies thereby more efficiently managing its inventory and order processes (Mustaffa & Potter, 2009; Haavik, 2000). However, Haavik (2000) mentions there are a need for accurate information on current stock levels and consumption for VMI to work successfully but providing such information within hospital can be difficult. Turhan and Vayvay (2009) also note some challenges of VMI as the partner might not be willing to share information system to share.
information. It is what once may have been an adversarial supplier. This is supported by Altricher and Caillet (2004) that found the lack of trust in the supply chain, the hospital kept over-ruling the VMI system, holding more stock and eliminating any benefit that accrued. The table1 shows the VMI implementation challenges in various industries.

### TABLE 1

<table>
<thead>
<tr>
<th>Industry</th>
<th>Key findings</th>
<th>Challenges</th>
<th>Focuses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Automotive industry</strong></td>
<td>Seldon and Affiliates (2000)</td>
<td>Customer reduces the administrative cost of holding stock while vendors get a guaranteed period of supply and achieve a predictable sales plan and more control in scheduling production</td>
<td>Internal and external VMI, accurate demand information</td>
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<td></td>
<td>Anthony (2007)</td>
<td><strong>VMI programs reduces inventory carrying costs, improve cycles time and reduces transit time</strong></td>
<td>External VMI</td>
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<td></td>
<td>Reddy and Vrat (2007)</td>
<td><strong>VMI model helps retailer to cut inventory related costs and keep inventory low</strong></td>
<td>External VMI</td>
</tr>
<tr>
<td><strong>Electronic industry</strong></td>
<td>Kuk (2003)</td>
<td><strong>VMI can result in lower incidences of stock-out situations and an increase in the levels of customer services and cost reduction due to an increase in inventory turn and a decrease in the level of a safety stock</strong></td>
<td>Internal and external VMI</td>
</tr>
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<td></td>
<td>Toni and Zamolo (2005)</td>
<td>Various advantages gain from this approach; immediate response to customer’s requirements, higher level of customer service, increased market visibility, improved planning, stock reduction, better management of risks and opportunities,</td>
<td>External VMI</td>
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<td></td>
<td>Blackhurst and Craighead (2006)</td>
<td><strong>VMI approach contributes to a win-win situation that result in increased customer service, reduced lead times and cost reduction due to increase inventory turns and decreasing levels of safety stock</strong></td>
<td>Internal and external VMI, accurate demand information</td>
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<td><strong>Healthcare industry</strong></td>
<td>Haavik (2000)</td>
<td>Healthcare sector gains financial benefits of Adopting VMI model due to inventory reduction and operational cost reduction</td>
<td>Accurate demand information</td>
</tr>
<tr>
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<td>Atricher and Caillet (2004)</td>
<td>VMI approach increase the overall reliability of the process, reduce time, lessen the risk of obsolescences, and reduces IT maintenance cost</td>
<td>-The lack of trust in the supply chain, the hospital kept over-ruling the VMI system, holding more stock and eliminating any benefit that accrued</td>
<td>Internal and external VMI, Accurate demand information</td>
</tr>
<tr>
<td>Mustofka and Potter(2009)</td>
<td>The VMI enhances wholesaler in healthcare industry to cope with urgent order and stock availability</td>
<td>-Gaining accurate information with regarding to inventory levels and usage levels is required -The visibility and transparency of the product and demand information has to be considered -The partner may not be willing to share totally information system -It is necessary to employ advance technology which is often expensive.</td>
<td>Internal VMI and accurate information</td>
</tr>
<tr>
<td>Turhan and Vayvay (2009)</td>
<td>The VMI strategy allows the pharmacists to do their own job. For supplier, it provides more time for planning so that the supplier is able to serve hospital and optimize operations better</td>
<td>-Demand Volatility due to marketing strategies -Difficult prioritizing customer shipments leads to product shortage -Technology requirement</td>
<td>External VMI and accurate information</td>
</tr>
<tr>
<td>Retail Industry Waller (1999)</td>
<td>VMI give benefit to manufacturers by improving services and reducing costs by permitting better resource utilization for production and transpotation</td>
<td>-Stock shortage result from priority service to VMI partner -Insufficient of system integration -Lack of customer specific data</td>
<td>External and Internal VMI, accurate demand information</td>
</tr>
<tr>
<td>Kumar and Kumar (2003)</td>
<td>Retailer can reduce inventory, stock out, forecasting and purchasing activities and increasing in sale while supplier s can improve visibility, SLA and Reduce PO error</td>
<td>-Sharing of outdated or inaccurate due in lack of adequate information technology as well lack of mutual trust -Retailer are excluded from the demand forecast process which contribute to inaccurate demand forecast</td>
<td>External VMI and accurate demand information</td>
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<td>Sari (2007)</td>
<td>For retailer, it contributes to higher product availability and service as well as lower inventory monitoring and ordering cost while it result in reduced bull whip effect and enhance resource utilization for vendor</td>
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In summary, the review of research implies that the layer of VMI can be divided into two layers which are internal VMI and External VMI. In term of internal VMI, it focuses on process inside the customer’s company how customer managed business process effectively in order to gain accurate demand information. In term of external VMI, it emphasizes on the process outside the customer’s company. This particularly concerns on how the customer share accurate demand information to supplier and then the suppliers are responsible for replenishing and managing the customer’s inventory. This can be summarized in figure 1 below. Additionally, it is found that the key success factors for VMI implementation are gaining accurate demand information and information sharing between supplier and customer. Thus, we will address these issues in our case study in the next section, the case study approach is adopted in order to investigate the implementation of VMI in the hospital in Thailand.
A CASE STUDY

The study took place in one of state-owned hospital in Thailand. In 2010, a new medical center is established in order to serve as the excellent service complex for 1,000 out-patients. It provides 350 beds, 16 operating rooms and 14 Intensive Units. The board directors decide to implement the VMI with the ambitious aim of improve operational performance together with enhancing customer satisfaction. To understand logistics flow of medical commodity in the hospital, interviews and focus group are conducted. The questions are investigated how medical commodities are flow and managed in the previous building which contributes to develop and apply methods into the new building. The study found that all of medicines and active ingredients are managed by the pharmaceutical groups. There are three major functions in the hospital; medical storeroom, central warehouse and the procurement department. Four medicine storerooms locate in outpatient department and one medicine storeroom locates in inpatient department. The figure 2 shows the medical supply chain in the new building.

**Procurement**

We interviewed with a director of procurement department so that we understand the nature of suppliers and the hospital’s procurement process. Currently, the procurement department deals directly with various suppliers from both public and private sectors. Under the policy, there are two main types of procurement process; Negotiation procurement and Bid procurement. Any procurement, not exceeding 300,000 baht, conforms to negotiation procurement. The procurement process is accomplished after both purchasing reserve (PR) and purchasing order (PO) documents are approved. For PR, It takes approximately 3-4 weeks which varies depending on the value of procurement activities and it requires 3 more days to proceeds the PO. Another method is the bid procurement. High valued medicines and any procurements exceeds than 2 million baht are conformed to this procurement method. According to this method, it
shortens the lead time for preceding the procurement process because it requires only the approved PO. This means the lead time for this

**Business Flow**

When medicines are delivered by suppliers, it is sent to the central warehouse. The pharmacists at the warehouse are responsible for checking against purchasing order and store these medicines in its warehouse. In the warehouse, the data information involving the amount of medicine, the supplier, batch number and so on is recorded in the back office system. Then the warehouse distributed medicines to each ward storeroom according to the requests. The medicine requisition from each ward to central warehouse is defined by each storeroom’s pharmacist. The pharmacist defines the quantity of each medicine type to replenish the stock in each ward by their own experience. This depends upon level of stock left in each storeroom and other conditions such as seasonal diseases, emergency request, new government regulations, etc. the pharmacist places this demand order to the warehouse everyday at 9 am. The warehouse collects all this requests and supplies this amount to each ward daily without knowing the stock level in each storeroom. In the storeroom, any product information including usage level, inventory level, or transaction, is recorded in the front office system which is integrated to the back office system. Therefore, this enables information flow freely from the warehouse to the storeroom and the information transferred back to the warehouse from the storeroom via integrated systems.

**IT System**

The hospital has two main systems for inventory management which are a back office and a front office. The back office system is used for managing inventory at the central warehouse. After the pharmacists at the warehouse receive medicines, this data information is recorded in the back office system. In the system, the supplier’s code is not being used but the hospital creates its own code in order to identify medicines in the hospital instead. However, it still requires mapping the hospital’s unique code and the supplier’s code for purchasing purpose. Another system is the front office system. It is employed to manage financial and inventory at the front office or the store rooms. Additionally, the store room sometimes is functioned as a small production line, when the physicians require producing medicine for special case. The new produce is manufactured while the new code is also created and recorded at the front office system. However, both systems are employed for different purpose but they are integrated in order to transferring information between them.

**ANALYSIS AND RESULTS**

As mention earlier, we conducted the literature reviews in order to understand necessary factors for VMI implementation. To succeed implementing VMI strategy in healthcare industry it requires the hospital to concern two layers of VMI which are internal and external. In term of internal VMI, it deals with internal supply chain in the hospital in which the central warehouse acts as the supplier that delivers medicines to various store rooms. Under the VMI concepts, the supplier take responsible for manage customer’s inventory. To operate customer’s inventory effectively, the supplier has to know the accurate information with regarding to the stock inventory and the actual demand. According to this point, the purpose of the internal VMI is required the central warehouse to see through the stock inventory at all store rooms in the hospital and monitor stock level which responses to the actual demand.

In term of external VMI, it focuses on the relationship between the hospital and its suppliers. In this case, the suppliers deal directly to the central warehouse with regardless to any store rooms in the hospital. Therefore, the project emphasizes on how the central warehouse share information according to the stock level and actual demand so that the suppliers are able to response to the purchasing order accurately and abruptly. In addition, the literature review also suggested that gaining accurate demand information is a critical success for VMI implementation. According to this point, we studied the current process in the hospital in order to understand which factors that might lead to inaccurate demand information. It is found that one major concern is the back and front interface. The IT system needs to be redesigned so that the information can flow smoothly between back and front system. As discussed above, we will propose three main process under the VMI pilot model which are internal VMI, external VMI and IT system.

**Internal VMI**

We emphasize on the business process which particularly concern on the interaction between the central warehouse and the store rooms. Currently, pharmacists in the store rooms managed inventories by themselves and decide to replenish the stock based on their experience. The warehouse is only responsible for collect the request from the store room. However, the to-be process is redesigned in order to improve and run the process effectively. In the new business
process, the responsibility in the replenishment process at the store room is reallocated. Instead of waiting for the request sending from the store room, the new process enables the central warehouse to know the actual usage level and update the stock daily. The decision support system will be implemented in order to provide information and suggest adjusting the amount in reservation document. Due to the standard feature in the back office system, it allows seeing through the stock level in each store room; therefore, the system is able to create the reservation document automatically. This means the replenishment process is decided based on the actual demand and it enables the central warehouse to obtain accurate demand information. The figure 3 shows the process flow between central warehouse and store room during 24 hours.

**FIGURE 3**
THE BUSINESS PROCESS FLOW BETWEEN STOREROOM AND CENTRAL WAREHOUSE
**External VMI**

It focuses on the business process between supplier and the central warehouse. It is found that in the AS-IS process the pharmacist at the central warehouse operating the purchasing process manually and sending the purchase order to the supplier via fax. The To-Be process aims to operate purchasing process automatically. According to the VMI concept, the supplier should be allowed to see the customer’s stock level and responsible for replenishment process. Hence, we propose a web portal to share stock level information and correspondent with the suppliers, illustrated in figure 4. This allows the distributor to see its own stock level and then share information to the supplier in order to respond to the demand abruptly.

**FIGURE 4**  
**PROCUREMENT PROCESSES**

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**IT system**

To succeed VMI implementation, IT system for both internal and external VMI is vital. In term of internal VMI, there are three main points consider. Firstly, the front office system must have the capability to collect stock on hand. It enables the front office, as a point of service, to collect the actual usage and deduct the stock real time when the medicines are prescribed to the patients. Therefore, the hospital will gain more accurate demand information which reflects the actual usage. Secondly, the back and front interface need to be seamlessly synchronized. The data synchronize between the front and the back office affects the accuracy and the timeliness of data collected. This also has an impact on VMI implementation which is demand-driven supply chain management. Thirdly, decision support system is another concern. This will enhance decision-making activities to operate effectively and efficiently. Based on the historical data and stock on hand, the system should suggest the user when and how much the stock should be fulfilled.

In term of external VMI, e-transaction and a web portal are proposed. E-transaction will be implemented in order to reduce error that might occur when operate manually. Web portal allows the supplier to know the quantity of its own products in the hospital’s inventory. This will enable the supplier to manage its own stock at its factory and response to the hospital’s demand abruptly.

**DISCUSSION AND CONCLUSION**

In this paper, we implement VMI approach, which is one of supply chain management concepts, into service industry-hospital. To implement VMI approach, we found that there are three key success factors that should be taken into account. First of all, the layer of VMI should be divided into two layers which are internal VMI and External VMI. In term of internal VMI, it focuses on process inside the customer’s company how customer managed business process effectively in order to gain accurate demand information. In term of external VMI, it emphasizes on the process outside the customer’s company. This particularly concerns on how the customer share accurate demand information to supplier and then the suppliers are responsible for replenishing and managing the customer’s inventory. Secondly, shortening the purchasing process is also required in order to succeed implementing VMI. As this approach is continuous replenishment which aim to be more responsive to customer demand. Shorten the purchasing process enables the supplier to response the customer’s demand better. Lastly, it is necessary to gain accurate demand information and adopt an enable technology to run VMI smoothly. Inaccurate demand information is a great barrier and leads to fail VMI. Thus, it has to ensure that both supplier and customer share accurate information. Additionally, the IT system is also an enable factor that drive both trading partner to integrate and collaborate effectively which lead to a successful VMI implementation.
REFERENCES


