AN ASSESSMENT OF THE EFFECT OF VENDOR MANAGED INVENTORY ON SUPPLY CHAIN PERFORMANCE IN MANUFACTURING SECTOR IN KENYA: A CASE OF EABL

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ABSTRACT

In Kenya many companies in manufacturing sector deploying Vendor Managed Inventory see failure due lack of demand sharing, attitude of employee towards changing of business model, supplier reluctance to hold higher inventory, requirement of standard product identification and integrated information system. The overall objective of the study was to assess the effect of Vendor Managed Inventory on supply chain performance in manufacturing sector in Kenya, a case of EABL. The study specifically aims to; assess the effect of demand forecasting on supply chain performance in manufacturing sector in Kenya; determine the effect of inventory management costs on supply chain performance in manufacturing sector in Kenya; establish the effect of information sharing on supply chain performance in manufacturing sector in Kenya and identify the effect of manufacturing planning on supply chain performance in manufacturing sector in Kenya. The study adopted a descriptive research design and the target population was a total of 90 supply chain management staff working at EABL in Nairobi. The study applied a census design to select all 90 staff as the study respondents. Questionnaires were used as the main data collection instruments and a pilot study was conducted to pretest questionnaires for reliability. Descriptive statistics and multiple regression analysis were used to analyze the gathered data and the results were presented on tables and charts. The study found out that VMI implementation helped to improve demand forecasting, reduced inventory management costs, led to better information sharing among supply chain partners and improved manufacturing planning and this affected organization supply chain performance. The study hence concluded that improvement in information sharing, followed by manufacturing planning, then reduction in inventory management costs and lastly demand affects supply chain performance. The study recommendations were: Manufacturing firms should therefore implement demand forecasting systems that enhance effective execution of activities for estimating the quantity of a product or service that consumers will purchase. The employed VMI systems should be more upgraded in order to improve on reduction of inventory management costs. Manufacturing firms should therefore employ Vendor Managed Inventory systems that ease the process of exchange of information among various supply chain partners and the management of manufacturing firms
should link VMI systems with modern and updated manufacturing planning systems that lead to effective execution of key manufacturing planning functions.

**Key Words:** Supply Chain Performance (SCP); Vendor Managed Inventory (VMI)

**INTRODUCTION**

A supply chain (SC) is defined as the network of facilities and activities that performs the functions of product development, procurement of material from suppliers, the movement of materials between facilities, the manufacturing of products, the distribution of finished goods to customers, and after-market support for sustainment (Christopher, 2008). Supply chain management is the coordination and management of a complex network of activities involved in delivering a finished product to the end-user or customer. It is a vital business function and the process includes sourcing raw materials and parts, manufacturing and assembling products, storage, order entry and tracking, distribution through the various channels and finally delivery to the customer (Sharma, 2007).

**Supply Chain Performance (SCP)**

Supply Chain Performance (SCP) refers to the overall supply chain's activities involved in meeting end-customer requirements, including product availability, timely delivery, and all the required inventory and capacity in the supply chain to deliver that performance in a responsive manner. SCP crosses company boundaries since it includes basic materials, components, sub-assemblies and finished products, and distribution through various channels to the end customer. It also crosses traditional functional organization lines such as procurement, manufacturing, distribution, marketing & sales, and research & development (Saad & Patel, 2006).

Globally, supply chains are very complex business networks that need to be managed collaboratively and optimized in order to enhance improved supply chain performance. Additionally, global business landscape is constantly and rapidly changing. Uncertainty, growing competition, shorter cycle times, more demanding customers, and pressure to cut costs are just a few characteristics of the 21st century business environment (Wang, 2011). In many manufacturing firms, it has become critical to measure, track, and manage the performance of supply chain processes since a large number of measurement approaches have been developed and used for measuring SCP, apart from very popular Balanced Scorecard, there are other measurement approaches like Supply Chain Council’s SCOR Model, the Logistics Scoreboard, Activity Based Costing (ABC) and Economic Value Analysis (EVA) (Barber, 2008).

In United States, supply chain performance has been a key determining factor for the success of many manufacturing firms. A major example is Walmart supply chain that has got three elements, distribution practices, operating its own fleet of trucks and technology. Benefits from its supply chain efficiency result in time savings, more cost-effective inventory management and improved product forecasting. The company also deals directly with manufacturers by allowing them to control inventory movement in its retail outlets and this leads to improved supply chain performance (Clara, 2015).

In Europe, many companies with complex, global supply chains have limited visibility across their supply chain, which makes performance monitoring and management difficult. Often, a
decision taken by one business unit can have a significant impact on the performance of the entire supply chain and the company overall. The situation is even more challenging because it is usually difficult to get to the root of the problem due to multiple disconnects at department and geographic levels. Many manufacturing firms in USA however have done a good job of establishing performance metrics at the operational and departmental level. But most firms have done so in isolation with a view to improve the performance of individual processes. They continue to struggle with building and maintaining alignment between cross-departmental metrics and mapping those operational metrics to enterprise KPIs. This prevalence of conflicting metrics and KPIs across the supply chain causes sub-optimal and, at times, counterproductive decisions (Ritu, 2010).

In China, the manufacturing sector is growing rapidly but has shrunk in most advanced economies. The growth has been mostly influenced by implementation of VMI practices that has significantly contributed to increased supply chain performance. However changes are required in the supply chain like significant increase in productivity and quality at the plant levels, pursuit of worldwide competitive manufacturing strategies and operations and successful integration into the global supply chains (Deloitte, 2007).

In Africa, many manufacturing firms are still struggling to embrace various strategies that could lead to increased supply chain performance. However its only in few countries that have advanced manufacturing sector such as South Africa and Egypt that have managed to embrace effective supply chain performance strategies. This has made many firms in South Africa and Egypt to gain a competitive advantage in the African regions (Miller, 2008).

In Egypt, implementation of effective manufacturing planning systems have impacted positively on supply chain performance in manufacturing companies hence leading to acquisition of a big market in the African Region. Most companies in Egypt have expanded their market in many African countries as result implementation of effective supply chain management strategies that are yet to be adopted by other manufacturing companies in East African Region (Njanja, 2009).

In Kenya, the concept of supply chain performance has not yet been embraced by many manufacturing companies and as result many manufacturing industries are facing competition both from multinational companies and imports in the domestic markets. The new competition parameters include improved quality, products with higher performance, reduced cost, a wider range of products with better services; all delivered at the same time. Many companies have not succeeded in maximizing their supply chains prospective because they have failed to develop the performance measures and metrics desired to fully integrate their supply chain, thereby maximizing effectiveness and efficiency (Gunasekaran, 2007).

**Vendor Managed Inventory (VMI)**

Vendor Managed Inventory (VMI) systems has gained prominence in the private sector as a task shifting approach to strengthening supply chain performance. With VMI systems, key decision rights concerning the timing and quantity of commodities to be replenished at the custodian’s location are transferred from the custodian to the vendor or supplier (Carter, 2008). In VMI, Commodities are automatically pushed to the custodian as the supplier checks the custodians’ stock status and responds, according to pre-established maximum and minimum stocking limits (Baker, 2008). Vendor managed Inventory can be defined as a means of optimizing supply chain
performance in which the supplier has access to the customer’s inventory data and is responsible for maintaining inventory level required by the customer (Flavin, 2007). Vendor managed Inventory was popularized in the late 1980s by Wal-Mart and Procter & Gamble, it was subsequently implemented by many other leading companies from different industries, such as Glaxosmithkline, Electrolux Italia Nestle and Tesco Boeing and Alcoa (Micheau, 2005). 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 levels.

In a VMI partnership, the supplier makes the inventory replenishment decision for the firms. This means that the supplier will monitor firm’s inventory level (physically or via electronic data processing – EDP) and makes periodic re-supply decision, on behalf of the firm, such as order quantities, shipping mode and timing. Order transaction that is normally generated by the firm (through its buyer), is now initiated by the supplier itself. Company will also relinquish control of its re-supply decision and also transfer financial responsibility for the inventory to the supplier (Waller, 2009).

Implementing VMI is not solo effort it can be beneficial if company wide effort is involved (George, 2004). VMI supply chain has improved dynamic response which causes reduction in manufacturing on cost and transportation demand (Disney, 2003). VMI gives benefits to retailer as manufacturers stock more to reduce risk of stock out which in turn reduces retailer holding and shortage cost and increases its profit (Brendra; 2004). Lee (2008) found that VMI greatly reduced inventory-carrying costs and stock-out problems while, at the same time, it offered the ability to synchronize both inventory and transportation decisions. Fox (2009) noted that VMI’s advantages included improved customer service, reduced demand uncertainty, reduced inventory requirements and reduced cost based on a case study at Johnson and Johnson in USA.

Successful VMI initiatives have been trumpeted by many companies such as Whitbread Beer Company, Barilla, Johnson & Johnson, Kodak Canada Inc. and Campbell Soup. Some of the advantages of VMI implementation, generally mentioned in literature are: reduction in customer demand uncertainty; reduction of inventory level; reduction of stock out number and frequency; more flexibility in production planning and distribution; and improvement of customer services (Disney & Towill, 2008). These benefits mainly derive from the fact that in VMI, distortion of demand information (known as the bullwhip effect) transferred from downstream supply network members to upstream members is minimized, thus making it possible to reduce the stock out situations and inventory costs, while at the same time increasing the service level (Cetinkaya & Lee, 2009).

In Kenya, the concept of Vendor Inventory Management has not yet been widely embraced by many manufacturing organizations and this has made many organizations to experience increased cost in the execution of inventory management functions (Mugo, 2008). In Kenya manufacturing sector, VMI effectiveness as a system is affected by inventory flow, the quality of ICT and quality of information and sharing but is not affected by the quality of relationship. This indicates that relationship the among VMI partners is developed on the basis of implementing the system based on trust and reliability (Benson, 2011). However, the quality of ICT is most important to facilitate sharing of information among the VMI partners in the supply chain (Fisher, 2007). Hausman (2003) proposed several metrics to measure performance in the SC
organized around three main pillars: services, activities and speed, other authors such as Lambert & Pohlen (2001) propose VMI benefits are established on the basis of financial performance and economic factors. From another perspective, Kleij & Smits (2003), suggest that measuring the performance of a SC should consider the fact that each company is a particular economic system and a different legal entity.

Supply chain performance is the ability to satisfy the ultimate customer in terms of both quality and cost (Chen & Paulraj, 2004). Although organizational managers are ultimately held accountable for organizational performance, organizational success first depends upon the performance of the supply chains in which the organization functions as a partner (Rosenzweig, 2003). Supply chain performance is dependent on the supply chain partners’ ability to adapt to a dynamic environment (Vanderhaeghe, 2003). Previous research has based supply chain performance on the ability of the supply chain to: deliver quality products and services in precise quantities and at precise times; and to minimize total cost of the products and services to the ultimate customers of the supply chain. VMI plays a major role towards improvement of the overall supply chain performance (Green & Inman, 2005).

STATEMENT OF THE PROBLEM
Managing supply chain in recent business environment is increasingly challenging (Sharma, 2007). Market globalization, short product life cycle, rapid technology, high complexities in logistics and distribution and involved manufacturing process, have led to complexities in managing supply chain (Neely, 2008). However, a firm’s biggest problem faced lately is greater uncertainties in demand and supply (Kaipia, Holmstrom & Tanskanen, 2009). On top of demand uncertainties, customers also require fast and reliable deliveries and more product features (Rosen, 2007).

Most companies worldwide have emphasized on the need to be effective in managing supply Chain activities (Fisher, 2007). One of the ways to improve supply chain performance is by implementing a vendor-managed inventory (VMI). Previous research has demonstrated that VMI is able to reduce manufacturing costs, lower inventory management costs, increase competitiveness and meet customer satisfaction (Waller, Johnson & Davis, 2009). According to Walters (2008) Vendor Managed Inventory (VMI) serves as one of significant tool for improving supply chain performance (Walters, 2008). In Kenya many companies in manufacturing sector deploying VMI see failure due to various reasons such as lack of demand sharing, attitude of employee towards changing of business model, supplier reluctance to hold higher inventory, requirement of standard product identification and integrated information system (Kapia, 2009). According to Mosses (2010) successful VMI implementation in Kenya manufacturing sector can play an important role towards improvement of the overall sector supply chain performance. Many firms in Kenya manufacturing sector find it challenging to realize increased supply chain performance in terms of the ability of the supply chain to: deliver quality products and services in precise quantities and at precise times; and to minimize total cost of the products and services to the ultimate customers of the supply chain (Muli, 2009).

Lee (2008) found out that VMI enhances supply chain performance by greatly reducing inventory-carrying costs and stock-out problems while, at the same time, it offers the ability to
synchronize both inventory and transportation decisions. Fox (2009) noted that VMI’s advantages on supply chain performance includes improved customer service, reduced demand uncertainty, reduced inventory requirements and reduced cost based on a case study at Johnson and Johnson. Despite the importance of vendor managed inventory on supply chain performance there lacks a specific study that have managed to effectively address the influence of VMI implementation on supply chain performance in manufacturing sector in Kenya. This has therefore created a major knowledge gap on the role of VMI on supply chain performance in manufacturing firms. It therefore against this background that this study was undertaken to fill the missing knowledge gap by assessing the effect of VMI implementation on supply chain performance in manufacturing sector in Kenya.

The overall objective of the study was to assess the effect of Vendor Managed Inventory on supply chain performance in manufacturing sector in Kenya, a case of EABL. The study specifically aimed to; assess the effect of demand forecasting on supply chain performance in manufacturing sector in Kenya; determine the effect of inventory management costs on supply chain performance in manufacturing sector in Kenya; establish the effect of information sharing on supply chain performance in manufacturing sector in Kenya and to identify the effect of manufacturing planning on supply chain performance in manufacturing sector in Kenya.

LITERATURE REVIEW

A number of studies have been conducted in relation to Vendor Managed Inventory and supply chain performance. This section discusses some of the studies that have attempted to address the effect of Vendor Managed Inventory on supply chain performance. A study by Dwyer (2007) found out that the supply chain performance of many manufacturing firms in United States was dependent on effectiveness of VMI implementation. Lambert (2012) found out that VMI played a major role in determination of the supply chain performance in many US manufacturing firms. Lambert (2012) noted that supply chain performance was determined by rate of delivery of quality products and services and delivery of goods in right quantities and at precise times. Cooper (2007) noted that in many Chinese manufacturing firms, VMI enhanced realization of increased level of supply chain performance by minimization of total cost of the products and services and realization of increased level of customer satisfaction due to better customer service.

Mitra (2008) noted that VMI plays an important role in demand forecasting in many manufacturing firms in England. Emmanuel (2009) made inferences that information sharing is a very critical factor that supports effective implementation of VMI in many manufacturing companies in Malaysia. A study by Macmillan (2009) revealed that manufacturing planning play a major role towards promoting supply chain performance in many manufacturing firms in South Africa.

Handfield (2007) affirmed that VMI plays an important role in enhancing effective implementation of effective demand forecasting system in many manufacturing firms in England. Acquach (2007) identified that VMI helped to improve demand forecasting in many UK manufacturing firms by reduction of customer demand uncertainty and determination of the required inventory levels. This was found to be made possible since VMI system helped to predict the inventory demands with greater accuracy and this eliminated cases of over production.
of goods and over supply of goods against the customers’ demands in the market hence resulting to high profitability.

Dominick (2014) found out that VMI helped to maintain required inventory levels in many manufacturing firms in Taiwan and this also assisted in implementation of effective distribution planning systems and this made the goods to be always available in the target market. Buttrick (2009) confirmed these findings when he found out that VMI assisted retail outlets in many Japanese retail outlets to maintain right inventory levels and this helped to save inventory storage costs and also assisted in effective distribution of goods to customers in the target market hence leading to increased level of customer satisfaction as result of better customer care service. This also led to increased sales revenue and increased organization profitability.

Storey, (2007) contended that inventory management practices is a key component of supply chain management and application of inventory management methods that do not obey the principle of economic order quantity lowers the level of supply chain performance in many manufacturing firms. Emberson (2007) argued that balancing the various tasks of inventory management means paying attention to three key aspects of any inventory. The first aspect has to do with time. In terms of materials acquired for inclusion in the total inventory, this means understanding how long it takes for a supplier to process an order and execute a delivery. Inventory management also demands that a solid understanding of how long it will take for those materials to transfer out of the inventory be established. Knowing these two important lead times makes it possible to know when to place an order and how many units must be ordered to keep production running smoothly (Godsell, 2006).

Economic order quantity is the level of inventory that minimizes total inventory holding costs and ordering costs (William, 2007). Application of inventory management practices that are not as per the economic order quantity leads to increased cost of ordering and holding the inventory and this hinders application of vendor inventory management practices in the retail outlets (Stock, 2010).

Cooper (2007) affirmed that lack of application of Economic Order Quantity in inventory management practices increases the total cost of ordering and holding stock and this lowers the effectiveness of organization Supply Chain Management practices. Long lead time and poor warehousing procedures also lowers the effectiveness of organization Supply Chain Management functions. Mitra (2008) contended that absence of effective VMI practices impacts negatively on economic order quantity by increasing the cost of ordering and holding the inventory. Miller (2005) affirmed that inventory management functions that are in tandem with EOQ model contributes towards minimization of organization inventory overheads and this leads towards realization of increased profit margin.

Stock (2010) affirmed that inventory management is not limited to documenting the delivery of raw materials and the movement of those materials into operational process. The movement of those materials as they go through the various stages of the operation is also important. Typically known as a goods or work in progress inventory, tracking materials as they are used to create finished goods also helps to identify the need to adjust ordering amounts before the raw materials inventory gets dangerously low or is inflated to an unfavorable level.
Silvestro (2007) noted that poor application of VMI practices makes the organization to assume full responsibility of managing inventory and this leads to increased cost of stock, increased cost of current liabilities, lowers the value of current assets and leads to cases of stock out costs since the organization lacks capacity to effectively coordinate and monitor stock movement in the organization. Nelson (2009) noted that that VMI practices facilitates effective application of EOQ by helping in reduction of inventory holding costs, inventory acquisition costs, elimination of stock out costs and reduction of inventory maintenance costs.

Boyer (2010) added that inventory management has to do with keeping accurate records of finished goods that are ready for shipment. This often means posting the production of newly completed goods to the inventory totals as well as subtracting the most recent shipments of finished goods to buyers. When the company has a return policy in place, there is usually a sub-category contained in the finished goods inventory to account for any returned goods that are reclassified as refurbished or second grade quality. Accurately maintaining figures on the finished goods inventory makes it possible to quickly convey information to sales personnel as to what is available and ready for shipment at any given time.

Harmon (2010) concurred that inventory management makes it possible to prepare accurate records that are used for accessing any taxes due on each inventory type. Without precise data regarding unit volumes within each phase of the overall operation, the company cannot accurately calculate the tax amounts. This could lead to underpaying the taxes due and possibly incurring stiff penalties in the event of an independent audit.

Emmanuel (2009) made inferences that information sharing is a very critical factor that supports effective implementation of VMI in many manufacturing companies in Malaysia. Reichheld (2008) noted that ICT creates an effective communication platform between suppliers and the organization inventory management department, it helps suppliers to effectively monitor inventory movement under VMI improves customer service and helps in reduction of lead times hence leading to realization of increased organization performance.

Wong (2012) study revealed that in many Chinese firms VMI helped in information sharing amongst supply chain partners when proper communication channel was applied, when effective ICT based system were used and the organization employees possessed relevant training on effective application of VMI systems. On the other hand Charles (2007) noted that information sharing under VMI required all the supply chain partners to work as team and organizations to employ effective supplier relationship management strategies. Priscilla, Manatsa & McLare (2008) noted that in many South African Retail Outlets, VMI assists in delivering reliable information at the right time and this avoids cases of information asymmetry amongst the supply chain partners hence leading to increased supply chain performance.

Nelson (2009) noted that poor supplier management created problems in monitoring and selecting competent suppliers and this led to delay in delivery, which created stock out costs. In Kenya, the concept of Vendor Management inventory has not yet been widely embraced by many manufacturing and retail organizations and this has made many organizations to experience increased cost in the execution of inventory management functions (Mugo, 2008). In Kenya retail outlets, VMI effectiveness as a system is affected by inventory flow, the quality of ICT and quality of information and sharing but is not affected by the quality of relationship. This
indicates that relationship among VMI partners is developed on the basis of implementing the system based on trust and reliability (Benson, 2011).

The quality of ICT is most important to facilitate sharing of information among the VMI partners in the supply chain (Fisher, 2007). VMI as a system is suitable for large and medium size supermarkets which have well established network systems and the capability to effectively run the system. Very small partners/suppliers may not afford to have a large warehouse, or afford to lease a large warehouse for an effective VMI. Secondly, a supermarket that is too small owing to its low buying power would lack capacity to support demand for goods that VMI warehousing requires (Benson, 2011).

Cristobal (2005) carried out a study on with an objective to analyze the effect of supplier development practices with different levels of implementation complexity on the firm's purchasing performance in Spain. The findings identified important interrelationships among the various supplier development practices, basic, moderate, and advanced. It was also noted that the implementation of supplier development practices significantly contributes to the prediction of purchasing performance. The study also revealed how involving suppliers in supplier development activities is important and may help buyers to increase their purchasing performance. The findings from the structural analysis helps to provide practicing managers with insights on how these practices and their benefits are related in terms of purchasing performance, thus affecting their ability to make better sourcing decisions. A study by Emmanuel (2009) found out that the performance of various small scale suppliers in Kenya has been declining drastically and this has resulted to closure of many small scale enterprises that deals in general supplies. Emmanuel further noted that the low performance was contributed by lack of effective inventory management systems like vendor inventory management.

A study by Macmillan (2009) revealed that manufacturing planning play a major role towards promoting supply chain performance in many manufacturing firms in South Africa. A study by Danese, (2007) found out that in many US manufacturing firms, the success of the extended VMI approach has depended on the adoption of a central information system that allows suppliers/manufacturing plants to decide how much and when to deliver taking into account of all the necessary information concerning different supply network members. The system supports the production planning and order cycle processes within the supply network on two levels, the first based on the sales forecasts of the distribution centers including a horizon of 18 months; and the second based on the suppliers/manufacturing plants decisions concerning the order confirmation within the frozen period, taking into account of possible unexpected requirements (Murray, 2007).

The first level is not different from the functioning of a traditional integrated production planning DRP-MRP system. The system operates automatically: it collects data concerning the different supply network members, on the basis of which it elaborates purchase, production and delivery proposals for a period of 18 months for each manufacturing plant or distribution centre (Kazim, 2007). The results of these elaborations are available to supply network members, that can access them in real time through the intranet of the pharmaceutical group. Moreover, they are periodically communicated to the independent suppliers involved in the VMI project. By having the sales forecasts of the distribution centres for a period of 18 months, as well as the estimated stock level in the different stocking points of the supply network and the purchasing, production
and delivery plans elaborated by the system, each single supply network actor has to arrange the activities to be carried out in the frozen period (Powell, 2007). This part of the production planning and order cycle processes represents the second level supported by the information system/technology and is managed by each supply network member that operates as supplier within the supply network (i.e. the raw material suppliers that replenish the manufacturing plants and the manufacturing plants that replenish the distribution centres) (Zhang & Dilts, 2007).

The main innovation of the described approach lies in the way in which the second planning level is managed: on the basis of the information on demand and on the estimated trend of the stock level, each supplier operates “manually”, deciding what proposals have to be confirmed or modified in the frozen period. These decisions can be made both by considering that the stock level of the supplied product/raw material can fluctuate within a range, sometimes used also in the traditional VMI – and by taking into account data on demand and on the stock level of all the supply network members, not simply of the direct customers (Goldstein, 2006).

Scott (2007) found out most retail outlets managers in China tend to consider VMI as an approach for managing materials and information flows between one or more customers and their immediate suppliers. On the other hand, Eisenhardt (2009) concurred that fierce competition in today's global markets has forced business enterprises to invest in, and focus attention on, their supply networks in a much broader sense. Zhang (2004) noted that Chinese and Japanese companies employs just in time technique to strengthen relationship between supply chain network participants and thus business relationships in various Chinese firms extends beyond enterprise boundaries and seeks to organize entire business processes throughout a value chain of multiple organizations.

Holmstrom (2007) noted that the implementation of the “traditional” VMI – i.e. limited to supplier-customer dyads – leads to wasting significant opportunities that could instead be exploited by managing the supply network as a whole rather than as a series of dyads. In fact when optimization is local, each supplier-customer dyad optimizes its processes without taking the impact on the other supply network members into account. As a consequence, the implementation of the traditional VMI allows only a partial optimization of the supply network, as it usually only involves supplier-customer dyads.

The literature review clearly gives an account of past major studies and theoretical issues on vendor inventory management practices. However, all the explored theoretical issues concentrated much on VMI general issues and hence failed to give suggestions on how manufacturing firms should implement VMI in order to improve on supply chain performance. This therefore, demonstrates that past empirical and theoretical literature is of little significance towards addressing the effect of VMI implementation on supply chain performance in manufacturing sector in Kenya, a case of EABL. This study unlike, studies in the literature review specifically narrowed its research undertakings into assessing the influence of VMI implementation on supply chain performance in manufacturing sector in Kenya, a case of EABL and hence contributed towards adding value to the theory and practice of VMI and supply chain performance.
METHODOLOGY
The study adopted a descriptive research design and the target population was a total of 90 supply chain management staff working at EABL in Nairobi. The study applied a census design to select all 90 staff as the study respondents. Questionnaires were used as the main data collection instruments and a pilot study was conducted to pretest questionnaires for reliability. Descriptive statistics and multiple regression analysis were used to analyze the gathered data and the results were presented on tables and charts. The multiple regression model was in the form: 
\[ Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \epsilon. \] Where: \( Y = \) Supply chain performance; \( \beta_0 = \) Constant; \( X_1 = \) Demand Forecasting; \( X_2 = \) Inventory Management; \( X_3 = \) Information Sharing; \( X_4 = \) Manufacturing Planning and \( \epsilon = \) error term.

RESULTS AND DISCUSSION
The study sought to assess the effect of demand forecasting on supply chain performance in manufacturing sector in Kenya. Descriptive statistics results showed that majority 43% of the respondents indicated that demand forecasting affected supply chain performance to a large extent, 23% of the respondents indicated that demand forecasting affected supply chain performance to a very large extent, 17% indicated to a moderate extent, 10% to a small extent and 7% not at all. These findings concurred with Lysons (2009) that demand forecasting plays a major role in determination of the supply chain performance in manufacturing firms.

The study also sought to assess the effect of demand forecasting factors on supply chain performance in manufacturing sector in Kenya. Respondents were requested to indicate the extent to which the key demand forecasting factors affected supply chain performance using a scale of 1 to 5 (1=not at all, 2= small extent, 3= moderate extent, 4=large extent and 5=very large extent. The demand forecasting factors included; reduction in customer demand uncertainty; reduction of inventory level; reduction of stock out number and frequency and flexibility in production planning and distribution. Descriptive statistics results showed that reduction in customer demand uncertainty had a mean score of 4.0167; reduction of inventory level had a mean score of 4.1833; reduction of stock out number and frequency had a mean score of 4.3667 and flexibility in production planning and distribution had a mean score of 4.0500. These findings implies that majority of the respondents agreed that all the demand forecasting factors notably; reduction in customer demand uncertainty; reduction of inventory level; reduction of stock out number and frequency and flexibility in production planning and distribution to a large extent affects supply chain performance. These findings concurred with Phillip (2008) that reduction in customer demand uncertainty; reduction of inventory level and reduction of stock out number and frequency affects supply chain performance in manufacturing firms. Hassan (2011) opined that demand forecasting in manufacturing firms is greatly influenced by reduction in customer demand uncertainty; reduction of inventory level and flexibility in production planning and distribution and all these determines supply chain performance of many organizations.

The study sought to determine the effect of inventory management costs on supply chain performance in manufacturing sector in Kenya. Majority 42% of the respondents indicated that inventory management costs affected supply chain performance to a large extent, 25% of the respondents indicated that inventory management costs affected supply chain performance to a very large extent, 20% indicated to a moderate extent, 8% to a small extent and 5% not at all.
These findings concurred with Mathew (2007) that Vendor Managed Inventory helps to reduce inventory management costs and this greatly affects supply chain performance in manufacturing firms. The study also assessed the extent to which inventory management costs factors affected supply chain performance in manufacturing sector in Kenya. Respondents were requested to indicate the extent to which the key inventory management cost factors affected supply chain performance using a scale of 1 to 5 (1=not at all, 2= small extent, 3= moderate extent, 4=large extent and 5=very large extent. The inventory management costs factors included; economic order quantity; stores management practices; lead time and inventory costs. Descriptive results shows that economic order quantity had a mean score of 4.3000; stores management practices had a mean score of 4.1833; lead time had a mean score of 4.3833 and inventory costs had a mean score of 4.2167. On average all the inventory management costs factors had an average mean of 4.2708 and an average of standard deviation and variance of 0.9247 and 0.864 respectively. These findings demonstrates that majority of the respondents agreed that all the inventory management costs factors notably; economic order quantity; stores management practices; lead time and inventory costs to a large extent affected supply chain performance in the organization. The findings are in agreement with Ayugi (2009) where he found out that VMI implementation contributes greatly towards reduction of economic order quantity and lead time hence leading to improved supply chain performance in many manufacturing firms.

The study sought to determine the effect of information sharing on supply chain performance in manufacturing sector in Kenya. Descriptive statistics results showed that majority 50% of the respondents indicated that information sharing affected supply chain performance to a large extent, 17% of the respondents indicated that information sharing affected supply chain performance to a very large extent, 17% indicated to a moderate extent, 10% to a small extent and 6% not at all. These findings concurred with Jeffrey (2007) that Vendor Managed Inventory practices improves information sharing and this helps to improve supply chain performance in manufacturing firms.

The study assessed the extent to which information sharing factors notably; communication channel; level of ICT application; team work and supplier relationship management affected supply chain performance in manufacturing sector in Kenya. Descriptive statistics results shows that communication channel had a mean score of 4.5167; level of ICT application had a mean score of 4.3833; team work had a mean score of 4.5500 and supplier relationship management had a mean score of 4.2500. On average all the information sharing factors had an average mean of 4.425 and an average of standard deviation and variance of 0.8012 and 0.649 respectively. These findings implies that most of the respondents agreed that all the information sharing factors notably; communication channel; level of ICT application; team work and supplier relationship management contributed greatly towards determination of organization supply chain performance. These findings validated finding by Mugo (2011) where he found out that information sharing factors under VMI are determined by communication channel; level of ICT application; team work and supplier relationship management and these plays a major role towards determination of organization supply chain performance.

The study sought to identify the effect of manufacturing planning on supply chain performance in manufacturing sector in Kenya. The findings showed that majority 47% of the respondents indicated that manufacturing planning affected supply chain performance to a large extent, 20%
of the respondents indicated that manufacturing planning affected supply chain performance to a very large extent, 17% indicated to a moderate extent, 13% to a small extent and 12% not at all. These findings concurred with Jeffrey (2007) that Vendor Managed Inventory practices leads to better manufacturing planning and this helps to improve supply chain performance in manufacturing firms.

The study also sought to assess the extent to which manufacturing planning factors affected supply chain performance in manufacturing sector in Kenya. The key manufacturing planning factors included; operational planning; financial planning; purchasing management and material requirement planning. From the findings, operational planning had a mean score of 4.4147; financial planning had a mean score of 4.2333; purchasing management had a mean score of 4.5167 and material requirement planning had a mean score of 4.1833. On average all the manufacturing planning factors had an average mean of 4.3375 and an average of standard deviation and variance of 0.81760 and 0.675 respectively. These findings implies that majority of the respondents agreed that all manufacturing planning factors notably; operational planning; financial planning; purchasing management and material requirement planning affected supply chain performance. According to Garner (2009) VMI plays a major role in facilitating effective execution of key manufacturing planning functions like operational planning; financial planning; purchasing management and material requirement planning and this affects supply chain performance of many manufacturing firms.

The study sought to determine supply chain performance for the organization for the five years (2011 to 2015). Supply chain performance was measured on basis of lead time, quality of goods, inventory costs and customer satisfaction for five years. Respondents were requested to indicate how they rated lead time, quality of goods, inventory costs and customer satisfaction for five years using a scale of 1-5 (1= poor, 2= below average, 3= average, 4=good and 5=excellent). The results were as presented in table 4.11, table 4.11, table 4.12 and table 4.13.

On rating lead time for the five years, table 4.11 presents that on average 5% of the respondents rated that the lead time was poor, 10% below average, 18% average, 44% good and 23% excellent. This demonstrates that the lead time improved as result of continuous improvement in implementation and upgrading of the VMI system.

On rating quality of goods and services for the five years, table 4.12 presents that on average 7% of the respondents rated that the quality of goods and services was poor, 11% below average, 15% average, 45% good and 22% excellent. This implies that the quality of goods and services also improved as result of continuous improvement in implementation and upgrading of the VMI system.

On rating inventory management costs for the five years, table 4.13 presents that on average 8% of the respondents rated that inventory management costs to be very low, 14% low, 36% average, 27% high and 17% very high. This implies that inventory management costs reduced as result of continuous improvement in implementation and upgrading of the VMI system. On rating the level of customer satisfaction for the five years, table 4.14 presents that on average 5% of the respondents rated the level of customer satisfaction to be very low, 13% low, 32% average, 33% high and 18% very high. This implies that the level of customer satisfaction also improved as result of continuous improvement in implementation and upgrading of the VMI system.
The results of regression analysis model coefficient of determination ($R^2$) was 0.624 and $R$ was 0.790 at 0.05 significance level as presented in table 1. The coefficient of determination ($R^2$, 0.624) indicated that 62.4% of the variation on supply chain performance is determined by demand forecasting, inventory management costs, information sharing and manufacturing planning. The remaining 37.6% of the variation on supply chain performance is determined by other variables not included in the study model. This shows that the model has a good fit since the value is above 50%. This concurred with Graham (2002) that ($R^2$) is always between 0 and 100%; 0% indicates that the model explains none of the variability of the response data around its mean and 100% indicates that the model explains all the variability of the response data around its mean. In general, the higher the ($R^2$) the better the model fits the data.

Table 1 Regression Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R</th>
<th>Std. Error of the Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.790(a)</td>
<td>.624</td>
<td>.597</td>
<td>.30624</td>
</tr>
</tbody>
</table>

a Predictors: (Constant), X4, X3, X1, X2

The results of Analysis of Variance (ANOVA) of the overall regression model in table 2 shows that the value of $F$ (22.858) with significant level of 0.00 is large enough to conclude that all the independent variables significantly affect supply chain performance.

Table 4.1 Analysis of Variance (ANOVA)

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>$F$</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Regression</td>
<td>8.575</td>
<td>4</td>
<td>2.144</td>
<td>22.858</td>
</tr>
<tr>
<td></td>
<td>Residual</td>
<td>5.158</td>
<td>55</td>
<td>.094</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>13.733</td>
<td>59</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a Predictors: (Constant), X4, X3, X1, X2
b Dependent Variable: Y

The results of the test of beta coefficients in table 3 shows the extent to which each independent variable affects supply chain performance. Based on the coefficient variables of all the independent variables in table 4.3, information sharing with a coefficient of 0.476 is the independent variable that affects most the dependent variable (Y) supply chain performance. This is followed by manufacturing planning ($X_4$) with a coefficient of 0.168, then inventory management costs ($X_2$) with a coefficient of 0.147 and lastly demands forecasting ($X_1$) with the least coefficient of with a coefficient of 0.087.

$$Y=0.604 + 0.476X_3 + 0.168X_4 + 0.147X_2 + 0.087X_1 + e$$
## Table 3 Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1 (Constant)</td>
<td>.604</td>
<td>.440</td>
<td>.107</td>
<td>1.374</td>
</tr>
<tr>
<td>Demand Forecasting</td>
<td>.087</td>
<td>.097</td>
<td>.107</td>
<td>.897</td>
</tr>
<tr>
<td>Inventory Management</td>
<td>.147</td>
<td>.148</td>
<td>.145</td>
<td>.996</td>
</tr>
<tr>
<td>Information sharing</td>
<td>.476</td>
<td>.167</td>
<td>.468</td>
<td>2.845</td>
</tr>
<tr>
<td>Manufacturing Planning</td>
<td>.168</td>
<td>.075</td>
<td>.226</td>
<td>2.249</td>
</tr>
</tbody>
</table>

a. Dependent Variable: Y

\[ Y = 0.604 + 0.476X_3 + 0.168X_4 + 0.147X_2 + 0.087X_1 + e \]

## CONCLUSIONS AND RECOMMENDATIONS

The study concluded that improvement in information sharing, followed by manufacturing planning, then reduction in inventory management costs and lastly demand affects supply chain performance in manufacturing sector in Kenya. The study also concluded that reduction in inventory management costs, followed by manufacturing planning, then demand forecasting and lastly information sharing affects supply chain performance. Vendor Managed Inventory plays a major role in improving demand forecasting which determines the state of the supply chain performance of organizations in manufacturing sector. Demand forecasting enhances effective execution of activities for estimating the quantity of a product or service that consumers will purchase. Demand forecasting activities helps in making pricing decisions, in assessing future capacity requirements, or in making decisions on whether to enter a new market. VMI leads to reduced, customer demand uncertainty, determination of the required inventory levels, reducing cases of stock out number and enhancing frequency and flexibility in production planning and distribution.

The study also concluded that Vendor Managed Inventory eases application of data collection, demand and forecasting, lean and operational principles to manage the total amount of inventory within the supply chain at any point in time and manage inventory holding costs. Vendor Managed Inventory helps manufacturing firms to reduce inventory management costs by enhancing application of economic order quantity; improvement of stores management practices; reduction of lead time and reduction of overall inventory costs and these to a large extent affected supply chain performance in manufacturing firms.
The study further concluded that Vendor Managed Inventory (VMI) helps in improvement of information sharing among supply chain partners and this plays a major role towards improvement of the overall supply chain performance of organizations in manufacturing sector. Vendor Managed Inventory systems eases the process of exchange of information among various supply chain partners. Information sharing factors under VMI are determined by communication channel; level of ICT application; team work and supplier relationship management and these plays a major role towards determination of organization supply chain performance.

The study finally concluded that Vendor Managed Inventory helps in improvement of supply chain performance by supporting effective execution of manufacturing planning functions. VMI plays a major role in facilitating effective execution of key manufacturing planning functions like operational planning; financial planning; purchasing management and material requirement planning and this affects supply chain performance of many manufacturing firms.

RECOMMENDATIONS OF THE STUDY

The study suggested the following recommendations as a measure to improve on supply performance in manufacturing firms. Demand forecasting determines the state of the supply chain performance of organizations in manufacturing sector. Manufacturing firms should therefore implement demand forecasting systems that enhances effective execution of activities for estimating the quantity of a product or service that consumers will purchase. Demand forecasting systems should also help in making pricing decisions, assessing future capacity requirements, or in making decisions on whether to enter a new market. The organization supply chain managers should ensure that the demand forecasting activities helps in elimination of customer demand uncertainty, helps in the determination of the required inventory levels, reduces cases of stock out number and enhances frequency and flexibility in production planning and distribution.

Vendor Managed Inventory helps in minimization of inventory management costs in manufacturing firms. Manufacturing firms should therefore effectively link all inventory management practices with the VMI system. The employed inventory management practices should facilitate application of inventory data collection, inventory demand and forecasting and lean and operational principles to manage the total amount of inventory within the supply chain at any point in time and manage inventory holding costs. The employed VMI systems should be more upgraded in order to improve on reduction of inventory management costs by enhancing application of economic order quantity; improvement of stores management practices; reduction of lead time and reduction of overall inventory costs and these to a large extent affected supply chain performance in manufacturing firms.

Vendor Managed Inventory (VMI) helps in improvement of information sharing among supply chain partners and this has a positive significant on supply chain performance of organizations in manufacturing sector. Manufacturing firms should therefore employ Vendor Managed Inventory systems that eases the process of exchange of information among various supply chain partners. To improve on information sharing, better ICT infrastructure should be implemented, better communication channel should be applied; level of ICT application across supply networks should be enhanced; team work among supply chain management staff should be promoted and supplier relationship management should be improved. The organization should also conduct
continuously employees training programs on use of ICT based VMI systems and also extend by training the suppliers and customers on how to use the systems.

Vendor Managed Inventory helps in improvement of supply chain performance by supporting effective execution of manufacturing planning functions. The management of manufacturing firms should link VMI systems with modern and updated manufacturing planning systems that lead to effective execution of key manufacturing planning functions like operational planning; financial planning; purchasing management and material requirement planning and this affects supply chain performance of many manufacturing firms. The employees should be regularly trained on modern VMI procedures and more staff professional supply chain management staff should be recruited.

REFERENCES


Ruth, L. (2008), Procurement Professional; 1st edition; East Africa Press


