

**THE EFFECTIVENESS OF VENDOR MANAGED INVENTORY (VMI)
TOWARDS IMPROVING SUPPLY CHAIN MANAGEMENT (SCM): A
CONTRACT MANUFACTURER PERSPECTIVE**

By

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Research report in partial fulfillment of the requirement for

The degree of Master of Business Administration

MARCH 2004

I would like to take this opportunity to show my appreciation to certain people whose contributions and assistance have been critical towards the completion of this project.

My heartfelt thanks and gratitude goes to Associates Professor T. Ramayah for his tireless effort and tremendous assistance. His comments have been invaluable and his guide remains inspiration by which I follow as I hike through the endless track of completion.

My mother, my wife and my truly friend have been my strength during the toughest days in the progress of writing the paper.

Thank you all.

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ABSTRAK

Kajian ini dilakukan untuk mengetahui setakat manakah faktor yang mempengaruhi pengurusan stok syarikat oleh kontraktor perkilangan dapat mempengaruhi pencapaian kontraktor perkilangan, terutamanya dalam segi perkongsian maklumat permintaan jualan, perkongsian maklumat syarikat dan perkongsian strategik. Sejumlah 80 firma kontraktor perkilangan telah membalas kaji selidik yang dijalankan dari sejumlah 124 firma yang dihubungi (64.5%). Analisa keputusan yang dibuat mendapati perkongsian maklumat dan perkongsian strategik mempunyai implikasi positif ke atas pencapaian kontraktor perkilangan. Semakin tinggi kedua-dua faktor tersebut dijalankan ke atas kontraktor perkilangan, maka semakin tinggilah pencapaian yang boleh di perolehi. Komunikasi yang berkesan nampaknya tidak mempengaruhi hubungan antara perkongsian maklumat dan perkongsian strategik ke atas pencapaian kontraktor perkilangan.

ABSTRACT

This study investigates the extent of VMI that may influence Contract Manufacturer performance, particularly the factors of demand sharing, information and strategic partnership, in Supply Chain management. Survey using questionnaire obtained a return of 80 out of 124 (64.5%). Analysis of the result shows that the information sharing and strategic partnership do have a positive impact on CM performance. The higher the level of both factors, the more CM performance will improve. Effective communication between extent of VMI and CM performance was hypothesized as a moderator, however it acts an independent predictor on the CM performance (resource utilization, output maximization and flexibility).

Chapter 1

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Managing supply chain in recent business environment is increasingly challenging. Market globalization, short product life cycle, rapid technology grow, high complexities in logistic and distribution and involved manufacturing process, have lead to complexities in managing supply chain. However, a firm's biggest problem faced lately is greater uncertainties in demand and supply (Kaipia, Holmstrom & Tanskanen, 2002). On top of demand uncertainties, customers also require fast and reliable deliveries and more product features (Olhager, Persson, Parborg & Rosen, 2002).

Clearly, traditional style in managing firm, which focused only on, order receiving, product manufacturing and delivery is irrelevant. A complex supply chain has emerged which involve raw material sourcing, manufacturing assembly, warehousing, inventory tracking, order entry and order management, distribution, delivery to customer and information system that integrate and monitor all of supply chain activities (Lummus & Vokurka, 1999).

Key players in a firm's supply chain, such as suppliers, retailers, manufacturers and distributors are strategically important in enhancing the firm's competitive advantage. Excellent cooperation and effective coordination from all parties involved in the whole supply chain is vital. Inefficient SCM has demonstrated a huge loss to the company and the industry as a whole. One study in US food industry estimated that poor coordination among supply chain partners has wasted \$30 billion annually (Fisher, 1997).

Customers, nowadays, evaluate firm's performance through a few new indicators such as firm's response time, delivery accuracy, ability to customize, lean and agile manufacturing. In order to achieve this expectation, firms must ensure all segments in its supply chain understand and standing by to face these challenges in order to stay competitive. The new key word in managing current supply chain is integration. With development in information technology, this integration has enabled all level and components in supply chain to react to market change via a numbers of ways such as on time delivery, auto material replenishment program, electronics resource planning program and etc. Bottom line, ability to serve customer with speed, focus and integrity will ultimately gained customer loyalty over time and enable the company to gain more cost benefit.

In this new era, supply chain management is about coordinating and integrating supply chain activities in a more organized and systematic manner (Tyan & Wee, 2003). In order to gain maximum benefit from this integration, firms are forced to form a strategic partnership with key players in its supply chain. A number of programs from strategic partnership, with the objective to increase efficiency in supply chain, has been studied and practiced by a numbers of firms such as collaboration with supplier on material replenishment system (MRP), flexible manufacturing concept with the manufacturer, automated warehouse with warehouse department, and etc.

Since 1980's, there is a new trend from firm's to implement what has been called the "Vendor Managed Inventory" (VMI) that serves as one of significant tool with an effort to increase firm's efficiency in managing its supply chain. VMI concept has gained

a significant acceptance in major industries such as petroleum, hotel, manufacturing, construction, food, apparel and etc.

1.2 Problem Statement

Most companies have emphasized on the need to be effective in managing its supply chain (Fisher, 1997). One of the ways to improve supply chain management is by implementing a vendor-managed inventory (VMI). Previous research has demonstrated that VMI is able to reduce manufacturing costs, lower inventory, increase competitiveness and meet customer satisfaction (Waller, Johnson & Davis, 1999). There are also cases where companies deploying VMI see failure due to various reasons such as lack of demand sharing (Blatherwick, 1998), attitude of employee towards changing of business model, supplier reluctance to hold higher inventory, requirement of standard product identification and integrated information system (Kapia, Holmstrom & Tanskanen, 2002) and etc. Aichlymar has investigated the implementation of VMI and reported that out of ten VMI implementation, only 3 reported success, and the another 3 reported some benefit, but not as much as anticipated and the other four did not result in any benefit or fail. The confidentiality of information sharing between company and supplier, the risk of loss of control by the retailers, the increase of vendor's administration costs and minimal benefit for supplier are the major weaknesses of VMI (Aichlymayr, 2000). While, many of those studies concentrated on successfulness of implementing VMI, there is no research that studies the quality or extent of VMI implemented by Contract manufacturer and improved its performance. Obviously, contract manufacturer with good relationship with its customer (OEM) will improve its

supply chain performance through better communication and good understanding among each other.

Thus, the aim of this study is to examine whether through implementation of VMI by a contract manufacturer, does it directly impact its performance. Besides, we also would like to understand how the extent of VMI adoption and contract manufacturer performance are influenced by effective communication (as moderator) or vice versa, with end in mind to enable CM to sustain its competitive advantage in today's complex and dynamic business environment.

1.3 Research Objectives

The study focuses on extent of adoption of VMI in contract manufacturer's activity as part of its supply chain management tool. In particular, this study seeks:-

- a. To identify factors that affect the supply chain management relationship.
- b. To study the extent of VMI implemented by contract manufacturers on its performance, particularly on resource, output and flexibility;
- c. To examine whether relationship factor (strategic partnership, effectiveness of communication and level of cooperation) between contract manufacturer and OEM moderates the impact on VMI adoption on contract manufacturer performance.

1.4 Research questions

The above objectives raise a few questions on the extent of VMI adopted by contract manufacturer, influence of effective communication and its impact on contract manufacturer performance. The questions are: -

- (i) How does the extent of demand sharing influence contract manufacturer performance?
- (ii) How does the level of information sharing influence contract manufacturer performance?
- (iii) How does the strategic partnership influence contract manufacturer performance?
- (iv) Do relationship factor (effective communication) between contract manufacturer and OEM moderates the impact on the extent of VMI implemented on contract manufacturer performance?

1.5 Scope of the Study

The study focuses on extent of VMI adopted by contract manufacturer from the aspect of demand sharing and information sharing and their impact on contract manufacturer performance. The study will be used to support the fact that vendor managed inventory do contribute positive relationship towards firm's performance. Some emphasis will be placed upon the orientation of extent of VMI and see whether demand sharing information sharing will indirectly bring about improvement in contract manufacturer performance.

1.6 Definition of Variables

Key terms used through out this thesis are defined below for case of reference.

1.6.1 Supply Chain Management

Traditional manufacturing operations only focus on customer demand, manufacturing operations and supplier inventory. However, in today's complex world, the linkages between customer and supplier or supply chain are more dynamic and real-time. A Supply Chain can be defined as a network of entities that starts with suppliers' suppliers and ends with the customers' customers for the production and delivery of goods and services (Olhager, Persson, Parborg & Rosen, 2002). Supply chain is an integrated process, which includes raw materials manufactured into final products, and then delivered to customer via a systematic distribution channel. Supply chain consists of four main clusters, which are supplier, manufacturer, distribution and consumers (Beamon, 1999). Each cluster in supply chain may comprise of numerous complexities which will be discussed further in the study.

1.6.2 Vendor managed Inventory

Vendor managed Inventory can be defined as 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, 2002). 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 make 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 also will relinquish control of its re-supply decision and also transfer financial responsibility for the inventory to the supplier (Waller, Johnson & Davis, 1999).

1.6.3 Contract Manufacturer

Lately, we are witnessing two trends that are having sweeping effect on both industries and customer, which is short product life cycle and mass customization (Barnes, Dai, Deng, Down, 2000). Electronics industry, for example, has started to experience this effect. Some products such as cell phones have a life cycle as short as 6 month. With such short product life cycle, being first to market is key for a company's survival. Consumers increasingly demand a highly customized, high quality product to be delivered quickly at a competitive price. Technology advances, in particular information technology, has further fueled the competition. Each firm needs to re-evaluate and identify its core competencies. Since meeting customer request and responding to market trend is quite a challenge, firms (mainly original equipment manufacturer - OEM) have tendency to ask outside firm, which specialize in manufacturing process and operate in high volume, to manufacture its product. Thus, contract manufacturer has come into picture and is expected to become an important segment in firm's supply chain management. Contract manufacturer can be briefly defined as independent companies that manage their customer's entire product line, offering an array of services from design to inventory management to delivery and after sale service. (Barnes, Dai Deng, Down

and Goh, Lau & Sharafali, 2000). Contract manufacturers serve a number of OEM, supply it product and services to all over the world and operates in high volume

CHAPTER 2

Literature Review

2.1 Introduction

This chapter will discuss the literature covering the evolution of supply chain management especially the rationale and the important of effective supply chain management in each firm. The characteristic of vendor-managed inventory (VMI) and significant of VMI in ensuring effective supply chain with implemented by firm will be discussed.

This literature review will further examine the extent of VMI through relationship factor which covers effective communication, as significant strategy in order to react fast in current vulnerable business situation. The element in performance measure based on Beamon' supply chain performance measure will also be discussed in this segment. This literature will examine further demand sharing, information sharing and strategic partnership, as it is an important element in VMI and also will form a fundamental of this study on extent of VMI and its alignment with effective communication in Contract Manufacturing.

2.1.1 The Evolution of Supply Chain Management (SCM)

In today's business environment, the combination of technology, economic and market forces has forced company to examine and re-invent its supply chain strategies in order to remain relevant. Supply chain has been defined in a numbers of ways, depending from company internal or external perspective. Supply chain has evolved from traditional

approach of supply, manufacture and deliver to customer to more complex network integration (Beamon, 1999). From definition point of view, Supply Chain Management (SCM) can briefly be defined as an integrated process where raw material are manufactured into final product and subsequently being delivered to customer (Beamon, 1999). Ellram & Cooper defined supply chain as an integrating philosophy that manages the total flow of a distribution channel from supplier to customer (Ellram & Cooper, 1993). Others suggest that supply chain is about going from the external customer, managing all the processes that are needed to provide the customer with value as requested (Monczka & Morgan, 1997). However, Lummus and Vokurka provided more conclusive definition based on current business environment, which explained that supply chain is about all the activity involved in delivering a product to customer from raw material sourcing, manufacturing, assembly, warehousing, inventory tracking, order entry and order management, distribution, delivery to customer and information system that integrate and monitor all this activities (Lummus & Vokurka, 1999). In other words, SCM consists of four major components, which is material supplier, production facilities, distribution services and customer that are linked together through inflow and outflow of information (Steven, 1989).

Supply chain has become a more important segment of current business environment largely due to that fact that a few companies are vertically integrated. Companies have become more specialized in what they are doing and has began searching for suppliers that can provide low costs and quality material (Lummus & Vokurka, 1999). Companies have to increase its depth in every aspect of its operations such as efficient delivery management, consistent lead-time, comprehensive

replenishment planning and etc. Later, it has become more important for companies to manage its entire network of supply to optimize overall performance.

2.1.2 Effective Supply Chain and the need for Performance Measure

A company will depend largely on how well it is able to respond to customer requirement in order to turn product to sales and eventually generating margins. It has become more difficult and less economical for companies to produce their needs on their own and at the same time gain customer loyalty and meet customer demand. As such outsourcing has become company's main strategy (Gunasekaran, Patel & Tirtiroglu, 2001). Supply chain is optimized when all four-business component (i.e. material supplier, production and assembly, logistic and warehouse and distribution services) are able to operate at minimum cost and eventually generate maximum revenue.

Un-optimized SCM will lead to firm's poor performance that eventually will translate into lower shareholders wealth. In some cases, un-optimized SCM has demonstrated a rise in product costs due to weak relations between supply chain partners as well as dysfunctional industry practices such as an over-reliance on price promotions. One study of the US food industry estimated that poor coordination among supply chain partners was wasting \$30 billion annually (Fisher, 1997). Supply chain in many other industries suffer from an excess of some products and a shortage of others owing to inability to predict demand (Fisher, 1997). The question is how do we know whether the supply chain model is operating at an optimized level? The need for optimum supply chain model has been a topic for discussion among scholars for quite some time.

2.2 Performance Measures in Supply Chain Management

Performance measures for each company are treated very differently and it is subjective to individual company (Kleijnen & Smits, 2003). Performance measures selection is a crucial step in evaluating supply chain model. While there is an increasing numbers of supply chain model introduced in the literature, there is little available supply chain performance measure selection. Most existing measures available is inappropriate or ineffective for certain type of supply chain model (Beamon, 1999).

Callilioni and Billington (2001) mentioned in their case study at Hewlett Packard, supply chain performance measures are determined by three metrics which are fill rate (percentage of demand filled from available stock), inventory turnover ratio and sales revenue (Callioni & Billington, 2001). Beamon has established a comprehensive framework on performance measure in supply chain through literature review. He emphases supply chain measure three types of performance measures, which are resource measure, output measures and flexibility measures. These three measures have been identified as important component for the success of any supply chain and has been widely used in most supply chain models. Each type of these performance measures has different goals and purpose as shown below:-

Table 2-1 Supply Chain Performance Measures

Performance measure type	Goal	Purpose
Resources	High Level of efficiency	Efficient resource management is critical to profitability
Output	High level of customer service	Without acceptable output, customer will turn to other supply chain
Flexibility	Ability to respond to a changing environment	In an uncertain environment, supply chains must be able to respond to change

Source: Beamon, 1999 – Measuring Supply Chain Performance

Gunasekaran , Patel & Tirtiroglu emphasize the need to study and determine measure and metrics for company for two reasons which are lack of a balanced approach and lack of clear differences between metrics at strategic, tactical and operational levels (Gunasekaran, Patel & Tirtiroglu, 2001). Many companies have realized the importance of measuring performance from financial and non-financial perspective. However, it is quite difficult to determine a balanced framework. Some companies have concentrated on financial performance measure and some have focused on operational measures. Such imbalance will lead to the company being unable to see a clearer picture of their organizational performance (Kaplan & Norton, 2001).

2.3 Vendor Managed Inventory (VMI)

Increased complexity and highly integrated supply chain in current business environment has increased pressure for companies to adapt to current competitive pressure. One of the supply chain tool in addressing these issues is by implementing Vendor Managed Inventory (VMI). It was started in the late 80's after Procter & Gamble began closer partnership with Wal-Mart through managing Wal-Mart's retail inventory and replenishment system (Waller, Johnson & Davis, 1999). Ever since, VMI has been used widely by Hewlett Packard with its strategic vendor (Walter, Johnson & Davis, 1999), Campbell Soup (Cachon & Fisher, 1997), Ericsson Mobile Communication (Olhager & Persson, 2002) and others.

2.3.1 Characteristic of VMI

VMI, which is also referred to as Supplier Managed inventory (SMI) or direct replenishment, is a strategic partnership agreement between a firm and its supplier. Under the VMI arrangement, supplier takes on the responsibility of managing the firm's inventory, which normally includes monitoring, planning and directly replenish inventory at firms' warehouse, for all the products that it supplies. From the operational perspective, under the VMI strategy, suppliers are responsible for firms' inventory control (Disney & Towill, 2003).

The supplier normally receives actual data on firms inventory, sales of goods, demand forecasting and etc. based on electronic data interchanges from the firm. Based on this data and information, supplier will determine the maximum and minimum limits of inventory that should be at the firm's site or firm's warehouse at any point of time.

Most of the time, this limit will be stated in VMI agreement signed by both parties. The firms will not pay for the goods that were shipped by supplier until the goods were sold to the customer.

Under the VMI arrangement, it is the supplier who determines when stocks are to be replenished and in what quantities, instead of passively responding to orders placed by the firm. This arrangement is usually guided by a contract, which specifies the financial terms, inventory constraints and performance target and expectation such as service measures, firm's and supplier liability, duration of the program and etc. (Aviv & Federgruen, 1998). VMI is an example of how it is possible to improve the efficiency of material flows in a firm and supplier partnership. By keeping the firm's inventory located at firm's site, the supplier then, can align his operations with the needs of the firm's requirement in a more transparent manner. The supplier no longer needs to guess what will be the actual requirement or demand and will know roughly what product to deliver (if firm with high mix product) (Holmstrom, 1998).

Under normal supply chain method, firm will trigger supplier through purchase order that were generated on perpetual basis, which varies from one firm to another. Supplier on the other hand will build and deliver parts or goods based upon this purchase order and deliver to the firm at a stipulated date. Under this arrangement, the firm will place orders to the supplier after their inventory is depleted by the end of the month (normal practice) or when firm receives sudden increase in order from end-customer.

With high short order (order with short notice for delivery) coupled with high expectation from end-customer, firms most of the time fail to submit purchase order on timely manner. What happened was during end on the month, supplier will receive a

bunch of purchase orders with very short requested shipment date and this will lead supplier into capacity issue and eventually unable to deliver on time (poor service level). In order to successfully execute VMI and solve the above issues, firms are obligated to provide suppliers with a few vital information such as demand forecast, firm inventory level, order rate and etc.

2.3.2 Vendor Managed Inventory (VMI) and Company Performance

VMI began in end 80's after Wal-Mart (a retailer) formed a partnership agreement with a grocery manufacturer – Procter and Gamble (P&G). This partnership started with simple desire to improve business relationships and was gradually enhanced by sharing information and knowledge about their respective markets. This collaboration has, in turn, formed a more effective execution on category management, continuous replenishment and process coordination and eventually makes the supply chain more efficient (Grean & Shaw, 1998).

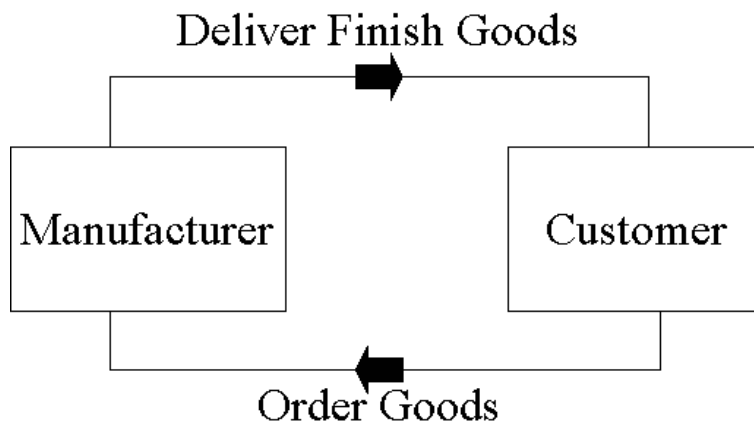


Fig 2-1: Traditional Order based replenishment Practice (adapted from Waller, Johnson & Davis, 1999)

VMI is an alternative for the traditional order based replenishment practice. Through traditional order based replenishment system, the customer will trigger purchase order as and when their inventories are at minimum quantity. The manufacturer on the other hand will process the material and deliver finished goods to customers based on the quantity ordered.

Vendor Managed Inventory emphasizes on solving replenishment through better supply chain coordination. Instead of putting more pressure on manufacturer ability to deliver goods fast and with accuracy, VMI gives manufacturer responsibility and authority to manage customer's entire replenishment process. The customer would provide the manufacturer with its inventory level, demand information and also set target for level of inventory that should be available at any point of time. Manufacturer will then, decide when and how much of the product to deliver.

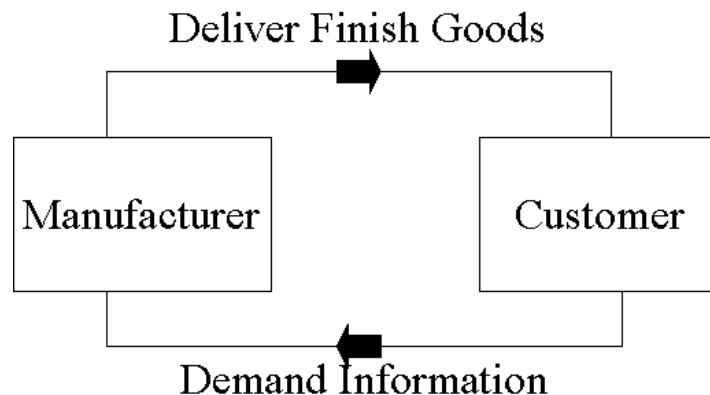


Fig 2-2: Vendor Managed Inventory (VMI) Concept of replenishment practice (Adapted from Waller, Johnson & Davis, 1999)

The main problems faced by manufacturer are long lead-time in sourcing material from international material supplier or producer and also high variability of incoming order from the customer. From customer perspectives, the key issues are high stocks and often delay in replenishment or delivery from manufacturer (Holmstrom, 1998).

Implementing VMI will enable customer and manufacturer to close this gap. The customer can ensure it will not be short of any parts that is required for its operations, while at the same time allow the reduction in inventory level, which will lead to better cash management. Also, with VMI, the customer can focus more on how to increase value added activity to their end-customer. The manufacturer, on the other hand, will be able to overcome inconsistent order pattern from customer, thus will increase its machine capacity and better resource utilization. And also, able to secure more order for materials that are having long lead-time.

In a case study conducted by Holmstron, partnership between manufacturer (supplier) and customer (wholesaler), in grocery industry, has resulted in a reduction in the delivery and administration costs for the customer. The benefit of the reduced delivery and administration costs, then, is transferred to the end-consumer. Eventually, both manufacturer and customer have secured competitive advantage through the introduction of VMI (Holmstron, 1998).

2.3.3 Demand Sharing in Vendor Managed Inventory

A key factor in determining a successful VMI is demand sharing. Good connectivity between the end-customer and manufacturer through which the manufacturer has direct access about end-customer order in order to enable them to make

better forecast and better respond to the customer inventory (Kuk, 2003). In VMI, customer will provide manufacturer with demand forecast, which will be used to determine stock up level and fill rate at customer's site. Also, this information will be used to determine the frequency of shipment delivery from the manufacturer's warehouse to the customer's warehouse. Manufacturer also will ensure the company will have certain weeks of inventory level as per mutually agreed. Demand volatility is key problem faced by most supply chain nowadays. Poor service level between firm and supplier may be influenced by a number of factors such as demand uncertainties, different planning calendars used by firm and supplier, un-notified product shortage, conflicting performance measures and etc. Strategic partnership, however, is able to mitigate the above problem and ensure smooth operational performance (Waller, Johnson & Davis, 1999).

Quite a number of researches have been conducted to explain how important demand sharing is in ensuring the effectiveness of supply chain management. Southard (2002) in his experimental study titled "Using Demand Knowledge to reduce Costs In A Service Delivery System: An Application of Discrete Event Simulation to a Service Delivery Problem" concluded that by using customer demand in implementing VMI, a firm's may help reduce firm costs in the whole supply chain.

Higher demand variability will lead supplier into inefficiency in delivering product and increase delivery costs. Research by Holmstron (1998) in his research "Business process Innovation in the Supply Chain – A Case Study of Implementing VMI" has indicated that by eliminating one layer of information flow (supplier knowing demand outlook originally from end-customer through firm), demand variability for

supplier has been reduced by 75% to 26%. This eventually reduced supplier cost through optimization of delivery schedule, on time product delivery and substantial inventory reduction, improved supplier lead-time (more predictable replenishment visibility) and increased supplier performance in delivering correct product mix.

2.3.4 Information sharing in Vendor Managed Inventory

Through VMI, effort in exchanging information has enabled firm to improve performance. VMI offers supplier access to the firm's sales information rather than letting supplier wait for purchase order only. This means that one level of order batching is removed, allowing a more accurate, more rapidly available, and more level demand information. On top of it, the supplier is free to choose the timing of the replenishment shipment such as the supplier can delay non-critical product during sudden ramp on certain product by end-customer (Kaipia, Holmstron & Tanskanen, 2002).

There are a number of information that was shared between strategic partners such as inventory level, sales data, order status, sales forecast, production and delivery schedule, lead times, capacity information and etc. Sawaya (2002) in his research "Inter-Organizational Information Sharing: An Exploratory Study of Practice and Determinants" has indicated that most frequent information that was shared between supplier and firm are demand forecast, inventory level and supplier lead time.

Aviv and Federgruen in their research "The Operational benefit of Information Sharing and VMI programs (1998)" have indicated that VMI arrangement has the potential of generating significant benefit of reducing operation costs by sharing of information. Average improvement of information sharing gives a range of 0.4% to 9.5%

of savings in reduction of supplier costs. VMI has enabled the customer's partnership channel to be more efficient due to better planning coordination, reduced needs for inventories with increased sales by focusing on selling what end-customer wants (Green & Shaw, 1999).

2.3.5 Strategic Partnership in Vendor Managed Inventory

One of the most critical aspects of VMI is strategic alliances or strategic partnership between the firm and the supplier (Tyan & Wee, 2003). VMI embodies with some basic understanding between the firms and the supplier. In VMI, the firm will transfer its inventory planning to the supplier while at the same time, the supplier will take ownership managing firm inventory and ensure that firm is able to deliver all that is required to its end-customer. With demand uncertainties from end-customer, shortening product life cycle and increasing request for product customization, making strategic partnership is far more important (Tyan & Wee, 2003).

One of key success in any business establishment is the level of trust between suppliers and manufacturers or customers. From operational point of view, trust will make most of operational issue be solved with good faith and towards meeting mutual common objective. After a certain period of time, simple business trust will be transformed into deeper level of understanding which being called 'strategic partnership'. Strategic partnership is important element before VMI could take place.

In order to remain competitive and be at the edge in meeting end-customer increasing demand, the entire supply chain must work closely and set common objectives. With the strategic partnership, the exchanges of information are able to take

place from two ways. The more information that is shared between partners, the better the service level can be expected from the partnership.

2.4 VMI in Contract Manufacturing Business Environment

There are a number of researches on implementation of VMI in grocery industry, retail industries, electronics industry, hotel industry, food based industries and construction industries that we can find from previous literature, but there is no specific research on the effectiveness of VMI in contract manufacturer (subcontractor) industry.

With higher manufacturing activity or manufacturing process is contracted out to specialist, this has created an industry which is know as contract manufacturing. A contract manufacturer's customers are Original Equipment Manufacturer (OEM) and / or Original Design Manufacturer (ODM). Contract manufacturer operates for a numbers of OEM or ODM and provides its services to companies' all over the world. Latest development is that OEM has trusted contract manufacturer to manage their whole product lines, such as offering an array of services from design, manufacture, inventory management, delivery and after sales service (Barnes, Dai, Deng, Goh, Lau, & Sharafali, 2000). In the Malaysia context, we have seen Flextronics in Johore Bharu plant, assembly and manufacture a complete Erickson mobile phone to be marketed to Asia market.

In contract manufacturer arrangement, OEM will provide a product design that includes bill of materials, expected delivery date, type of packaging and etc. Contract manufacturer, in turn, will assemble the product, with their own machine, facility and process flow, based on requirement and product design provided by OEM and make

delivery based on the time frame agreed. Contract manufacturer will also involve bulk material purchasing from supplier where most of its material is standard material. Examples of big contract manufacturer in the world are Amkor Ltd., Flextronics Ltd., Advance Semiconductor Electronics (ASE), Celestica Corp and etc. There are also a few contract manufacturers in Malaysia such as Globetronics Bhd., Unisem Bhd., Carsem Bhd., AIC Corporation, ISO Technology, Omega Semiconductor, Polar Twin Advance and etc.

2.5 Benefit of VMI

There a number of literature that testify to the benefit of implementing VMI either from business perspective or operational perspective with end in mind to sustain competitive advantage in the current business environment. Through VMI, firms are able to increase its performance in delivery process. A study that was conducted at a grocery manufacturer and a retailer in Finland, has provided an important finding about the benefit of implementing VMI in the area of ability to adapt in demand variability, while at the same time meeting all delivery date (Kaipia, Holmstron & Tanskanen, 2002).

For firms that implement the VMI, they have gained lower delivery and administration costs for its business and this will allow firms to translate this cost savings to end customer (Holmstrom, 1998). With more predicted demand and information sharing, a more collaborative transport management can be considered and eventually enable firm to increase its supply chain efficiency (Tyan & Wee, 2002). As such, with ability to lower operation costs, enhanced firm's capability to increase its competitive advantage and enable the firm to position at the edge among its competitor.

From operational perspective, firms are relieved from the burden to specify, place and monitor purchase order to the supplier while at the same time focus on meeting all end-customer requirement and deliver fullest service level to the end-customer. VMI, from the supplier point of view, could benefit from reducing forecast uncertainties by the firms, reduce logistic costs, reduce overall lead-times, improve service level and reduction of transportation costs (Aviv & Federgruen, 1998). Several case studies have indicated that the benefit of VMI in the area of planning and inventory control can be quite significant. Kaipia, Holmstrom and Tanskanen (2002) in their study entitled “VMI: What are you losing if you let your customer place orders?” demonstrated that VMI has enabled a substantial inventory reduction as well as changing production style from make to stock to make to order production.

Through VMI, the supplier can make replenishment decisions according to operating needs and also highlighting of trends in demand. The firm will gain benefit from lower cycle stocks, not just low end-of-month inventories intended to increase firm performance (Waller, Johnson & Davis, 1999). VMI also helps to make the administration of the delivery process more efficient (Holmstrom, 1998) (Waller, Johnson & Davis, 1999).

2.6 Problem with VMI

Despite a lot of benefit generated through implementing VMI, implementation is not that easy. Vergin and Barr (1999) has studied that from ten of the Fortune 500 consumer product manufacturing company that have been involved in VMI, only two of this manufacturing companies are able to realize the improvement in their operations,