In-House Delivery: An Analysis of a Materials Supply Model at Ericsson Corporation

Stefan Eriksson

Technology and Built Environment, Industrial Engineering and Management, University of Gävle, Sweden
sen@hig.se

Abstract

This paper gives an account of and analyzes a concept for materials supply within Ericsson Corporation. The study is focused on the customer's point of view. The concept, called by Ericsson In-House Delivery (IHD), could be identified as a manual form of the principle of Vendor Managed Inventory (VMI). In IHD the supplier has the responsibility for dimensioning the customer's production store and also for physically replenishing the storeroom without any traditional purchase orders or transactions in IT systems regarding inventory control. This method contrasts with the more traditional Material Requirements Planning (MRP), which is more dependent on data than IHD is. IHD also differ to how VMI normally is implemented using IT-based solutions. IHD could be an uncomplicated method for manufacturing companies to manage non-critical purchased parts or standard parts with low economical importance, and its use could help the company achieve its logistics goals.

Keywords: Logistics/supply chain, Materials supply, Manual form of VMI.

1 Introduction

To become competitive, companies must adjust themselves to new prerequisites and possibilities regarding technological and market contexts. Their adjustments must also include the supply chains, the companies’ role in that aspect and their relations within the supply chains (Mattsson, 2002). Persson (1997) also stresses that supply chain management goals, including the efficient use of resources, reduced lead times and increased customer service, will reduce the companies’ costs and increase revenues. Therefore it is important that the materials supply (for instance, replenishments of raw materials from a supplier) is characterized by high cost efficiency and a high level of customer service.

To respond to this, the principle of Vendor Managed Inventory (VMI) has been developed. VMI implies that the supplier takes over some of the customer’s activities in the materials supply process, partly controlling and taking responsibility for the customer's inventory. With VMI no traditional purchase orders are necessary and replenishment is dependent on actual consumption in production. VMI could be an
alternative to the traditional principle of Material Requirements Planning (MRP). Briefly, MRP implies that purchase orders are calculated in advance, depending on prognoses and other data. All these data and calculations with MRP are handled and made through the companies' Enterprise Resource Planning (ERP) systems. According to Kumar and Meade (2002) there are problems with MRP because of the constant changes in the volumes and demands of immediate deliveries, which MRP has some difficulties responding to.

Partly because of this, the telecom company Ericsson has developed and implemented different kinds of alternatives to MRP for the replenishment process of materials. Ericsson calls one of these alternatives In-House Delivery (IHD), which could be identified as a manual form of the principle of Vendor Managed Inventory (VMI). Searches in databases indicate that this concept of IHD is apparently missing from the academic literature. According to Mattsson (2002) VMI with IT-based solutions is also the most common approach for VMI between industrial companies. Moreover, a prerequisite in that context is IT-based information exchange. Since IHD also contrasts with this, the study of a manual form of VMI for industrial applications presented here, can be motivated.

The intended contribution to academia of this study is to increase the knowledge of an alternative approach of VMI, which also can be applied to other manufacturing companies than Ericsson.

The purpose of this study is to analyze Ericsson’s IHD supply model from the customer’s point of view. The research questions are: What are the characteristics of the IHD supply model? When is it suitable to apply IHD? What are the effects on logistics goals of using IHD?

2 Research Methodology

The research takes a qualitative approach to a single case study in a large international company in the telecom industry, Ericsson Corporation, specifically, its plant in Gävle. In the study, semi-structured interviews and observations have been used for collecting empirical data. These methods are central in qualitative research (Silverman 2006). Interviews were conducted with different kind of employees, such as managers, purchasers, planners, production engineers and process developers. Most of the interviews were conducted at Ericsson's plant with respondents one at a time, but complementary data collection occurred by telephone and e-mail. During the interviews minutes were taken that were later confirmed by the respondents. Observations were also made by literally following the material flow from the receiving area to the production area; these observations resulted in flow chart which contributes to a clearer description of the IHD model.

A theoretical framework was created from earlier research in order to understand important factors regarding materials supply. When studying research articles from databases various concepts and search terms were used to search and collect material for the framework. Furthermore, the theoretical framework stands as a basis for the analysis model that has been developed. The analysis model is used to discuss and analyze the empirical data, thus giving answers to the research questions.
3 Analysis model and the theoretical framework

The theoretical framework begins with a presentation of the analysis model (figure 1) and after that the content/background of the model will be described.

The model consists of four main areas: Product (1), Supply control (2), Relationship to the supplier (3) and Logistics goals (4). The main areas in the analysis model consist of important factors/principles regarding materials supply. To the right the supply model from industry will be placed when analysing it. The supply model IHD will be discussed and related to each main area in the analysis section.

Figure 1. The analysis model.

3.1 Product (1)
Complexity, cost and volume
The characteristics of purchased products could be essential when deciding what supply model to be used. For classifying and identifying characteristics for purchased products, Krajlic's matrix could be used (Figure 2).
The axis "Importance of purchase" describes the importance of the parts cost, degree of value-added influence (high or low value) and the share of the total cost represented by the material cost. The other axis, "Complexity of supplier market", focuses on availability on the market, the number of suppliers and the speed of technology development (Bjornland et al., 2003).

In the matrix non-critical parts means most standard parts with little economical importance for the company (low price per item). These parts are least important and the company should not spend much time on them (Bjornland et al., 2003). This is also in line with Mattsson (2002) who argues that simple forms of collaboration, agreement and routines are important when dealing with these parts. Leverage parts, on the other hand, have a great economic importance, but low risk concerning the number of suppliers and a good supply of material on the market. These parts could be a large part of the total procurement costs. Regarding the bottleneck parts, they have a small impact on the companies’ economy (low price per part) but instead high complexity, low availability on the market and a small number of suppliers. Most important for the companies are the strategic parts, which have a great economic impact with a high complexity and a small number of suppliers (Bjornland et al., 2003).

For purchased products there is often some acceptance control made when the products are arriving at the customer’s plant. The extent of the control depends on the product’s price, its complexity and the supplier’s ability to deliver with high quality. The acceptance control not only includes the product’s functioning but also quantity control, to ensure that the inventory on hand is correct. Otherwise, registering a product erroneously could mean that the IT system has the wrong data for the ordering process, which may lead to material shortages (Oskarsson et al., 2003).

*Shape*

The shape of the products could necessitate different solutions for storing and handling (Institute for Transport Research, 2002). Bulky goods can be described as goods with low density, thus having a large volume and small mass (Lumsden, 2006).

### 3.2 Supply control (2)

In this section different principles/concepts are described which could be important when describing and analyzing a replenishment process and how a certain supply model is related to principles like pull, VMI and MRP.
Material handling
Material handling can be defined as physical handling, moving, storing and packaging of material (Institute for Transport Research, 2002). According to Oskarsson et al. (2003) all material handling is associated with costs and the performance of material handling has an influence on costs, delivery reliability and lead time. This implies that effective material handling is essential.

Inventory control
Effective inventory control is important to a company's effectiveness. One principle for controlling inventory is the method of kanban. According to Olhager (2000) the principle is an uncomplicated method where a visible card gives a signal for replenishment. Another method is a periodic review system, which means fixed delivery days; this can lead to effectiveness in transport, see Oskarsson et al. (2003). In this context also inventory accuracy is of importance for business. According to Wild (2004) this will affect the whole company, from stockroom operations to sales and finance. Furthermore Axsäter (1995) argues that it is generally difficult to maintain a good inventory balance because of in and out registrations, since that kind of registrations could be a potential source of inaccuracies. Additionally, Wild (2004) stresses that simple processes to operate inventories could increase inventory accuracy.

Pull
The principle of pull means that no products should be made nor components ordered until there is a requirement. The opposite is push, where anticipated demands start production or ordering of components (Christopher, 2005). Some advantages with pull are that it is demand driven and can be controlled with small resources as well as that throughput lead times and tied-up capital can be reduced (Oskarsson et al., 2003).

VMI
With the concept of Vendor Managed Inventory, the suppliers take the responsibility for the management and replenishment of inventory and no orders are received at the supplier, unlike the traditional way. Benefits to using this concept include reduced inventory levels for both the customer and the supplier, and a reduction of risk that an item will be out of stock at the customer’s storage. The supplier can also much better plan and schedule his own activities. So there are benefits for both supplier and customer (Christopher, 2005). Pohlen and Goldsby (2003) also claim these advantages. This is also in line with Mattsson (2002) who argues that applying VMI in most cases reduces the total cost in the customer and supplier relationship compared to the traditional way. Mattsson (2002) also state that VMI with IT-based solutions is the most common approach for VMI between industrial companies. In that context a prerequisite is IT-based information exchange. This information could include inventory balances, forecasts and historical consumption. However, Mattsson (2002) also refers to another manual form of VMI solution that is applied in food stores and for indirect materials (such as office supplies) for companies where the supplier regularly visits customers. There, visual control of stock levels takes place.
**MRP**

Material Requirements Planning is a method which in principle relies on scheduling time for new deliveries according to calculations of when the net requirement occurs. Planning for materials belonging to the end product is calculated through the product structure (BOM). The start for this process is the production plan of the end products. The production plan consists of quantities and when these must be produced. From this, material needs for raw materials and other purchased parts in the structure are calculated based on inventory on hand and already planned orders. The prerequisites for MRP are data consisting of production plans/anticipated demands, production structure, inventory on hand, lot-sizing principles and lead times (Mattsson and Jonsson, 2003). All these data and calculations with MRP are handled through the companies’ ERP system.

According to Kumar and Meade (2002) there are some problems with MRP. They state that in theory the principles of MRP would work, but in practice there are several problems with making MRP function well. This is due among other reasons to the fact that manufacturers today are in an environment of constant changes in volumes, demands for shorter lead times, the need for immediate delivery, and increased complexity in products. MRP also requires a great number of employees to maintain accuracy. Important are also that the mechanism behind the MRP is complex to understand, since the information is inside the computer, and its use is unknown to many people. The basis of MRP is a forecast at the finished goods level. This is something that has been proven to be very difficult, if not impossible, to do with a reasonable level of accuracy. It is clear that the day of being able to accurately predict what the customer will buy and when they will buy it has passed. MRP also requires current and accurate data for calculations. Today there are powerful computers for these calculations, but because there are a lot of changes, manual entries and maintenance are needed in the data records. Aldridge and Bett (1995) also give indications of problems with MRP and stress that all manufacturers need to question their planning system.

### 3.3 Relationship to the supplier (3)

This section describes aspects of information, communication and geographical proximity that could be important in the relationship to the supplier

**Information and communication**

Access to information (e.g., delivery plans/forecasts, history of consumption, order and inventory status) with high quality is necessary for an effective supply chain (Mattsson, 2002). Christopher and Lee (2004) also declare that the need for shared information is of great importance. The information should be highly accurate and timely so that it can be used to take control of supply chain operations, thereby reducing uncertainties and providing prerequisites for a demand-driven chain. Vigit (2007) as well emphasizes the importance of information in a VMI relationship to accomplish an effective replenishment situation. Her findings are that information about current inventory balance is most important. Other important elements are, according to her, production schedule, stock withdrawals, incoming orders and point of sales data. She also emphasizes that the frequency of information exchange should be related to the supplier’s need of replanning. In this context, Pohlen and Goldsby (2003) point out that trust is necessary between the parties to make the VMI relationship work; this cannot be overstated.
Geographical proximity
According to the literature, it is important for suppliers to be close to customers. Among others, Karlsson and Norr (1994) point out suppliers in a just-in-time (JIT) system have an advantage if they are located close to the buyer’s plant. In addition Mattsson (2002) point out the need for short distances between customer and supplier for effectiveness in the supply chain and proclaim that the benefits are lower transportation costs, higher frequency in deliveries, high delivery flexibility and better prerequisites for effective communication and development work.

3.4 Logistics goals (4)
The goal with logistics is to achieve a high level of delivery service with low costs (Oskarsson et al., 2003). Furthermore, Persson (1997) explain the connection between logistics/supply chain management’s goals and profitability and points out that increased profitability is achieved by reduced costs and revenue improvements. This will in its turn be achieved by efficient use of resources, reduced inventory, reduced lead time and increased customer service. The concept of customer service subsumes delivery service within it. Different elements regarding logistics goals will be described below, starting with delivery service.

Delivery service
Oskarsson et al. (2003) give examples of how delivery service can be divided into different elements such as lead time, delivery reliability (reliability in lead time), delivery dependability (the right goods in the right amount and quality), flexibility and fill rate (availability in stock or the share of orders that can be delivered immediately). In the analysis section, delivery reliability and delivery dependability will be considered as delivery reliability, in line with Olhager (2000). It is essential to point out that delivery service is important both internally (deliveries between different departments) and externally (Oskarsson et al. 2003). Focus on these delivery service elements is of great importance because risks in the supply chain can be caused by problems with the service delivered (Christopher and Lee, 2004).

Capital tied up
Reducing inventory is of great importance because holding inventory does not add value to the company, since inventory ties up money that could be used for other purposes and have an impact on corporate profitability (Grant et al., 2006). The cost for tied-up capital depends mostly on the capital cost itself, but also on costs such as those due to material handling, equipment, employees in the store and the store facility (Olhager, 2000).

Use of resources
The kind of resources handled here are resources associated with purchasing/administration. According to Gadde and Håkansson (1998), a company’s ability to earn revenue depends on how its purchase activities are handled, since the purchase costs are a large part of the total costs in a company. Besides the direct cost (the cost of the product itself) there are also indirect costs to focus on, like costs for tied-up capital, administration, claims and material handling, which could affect how purchase activities are carried out. An example of indirect costs which could be high is cost related to planning and administration of orders and activities regarding invoicing. Especially for products of small economical value, these costs could be
relatively considerable. But if supplier and customer together develop an effective system for these activities and cooperate more thoroughly and with a long-term perspective, savings is possible. This could also imply better coordination and commitment.

4 The IHD supply model at Ericsson

Figure 3 below describes the material flows for purchased products with IHD and the traditional principle of MRP at Ericsson’s plant. The flow with MRP is described in order to easier understand the concept of IHD and to make comparison with. The upper part depicts the flow controlled by MRP. Here the products proceed through activities in the receiving area (e.g., unpacking, registration in IT systems and quality control). After this the products are stored in the main warehouse. Later the items will be moved to the production storeroom, where they are stored until they are used in manufacturing. In this principle of MRP, inventory on hand is available in the IT system (material handling and ERP systems). Purchase orders are placed through the IT system. Material handling activities are also done by Ericsson personnel.

With IHD, the lower part of Figure 3, the supplier has free access to the plant and delivers products directly to the IHD production storeroom (A in the figure). In IHD no receiving activities take place, nor are products stored in the main warehouse. Furthermore, inventory on hand is not available in the IT system, but rather physically visible. The supplier visits the plants regularly (every other week) and is responsible for replenishment of the production store. The supplier inspects the inventory on hand physically and refills it if necessary. Thus the supplier brings material with him and takes care of the material handling activities, including transportation.

Figure 3. The material flow with MRP and IHD.

In IHD storage smaller goods are stored in small plastic boxes and larger materials in other larger pallets (for instance, larger plastic boxes or half pallets). The production personnel pick material themselves from the production store (A in the figure) which is put into smaller stores (B) next to the production line.
The IHD store (A) is a separately marked area within the production storeroom, in order to reduce the risk that IHD items could be mixed with other non-IHD material. Furthermore, the IHD store is controlled by a two-bin system (each bin covers some weeks of consumption) which means that when one bin is empty the other bin is used. For smaller items the empty bin (plastic box), marked with the part number and quantity needed, is put into a square (C) to indicate the need for replenishment. For larger items, a so-called pallet flag (attached to the pallet) is moved to the same square whereas the pallet itself remains in the production storeroom. The pallet flag (a piece of plastic marked with part number and replenishment quantity) works like a kanban. The responsibility to move empty boxes or pallet flags to the square is the production personnel's.

When the supplier arrives, he refills the store, checks the square (C), and brings the empty boxes and pallet flags to his plant. This indicates the need for replenishment at the next replenishment occasion, when the supplier then puts the refilled boxes in location in the store and refills the pallets with the corresponding pallet flag then attached to the pallet. At the visit the supplier also checks if there is some bin starting on the month with highest demands. The supplier then sends a note to the buyers to confirm the new bin levels.

The supplier has the responsibility to make the dimensioning of the bins based on the forecasts that Ericsson buyers send monthly via e-mail as an Excel file. The supplier modifies the forecast to quantities per week (average values per week), but lets the dimensioning be determined by the month with highest demands. The supplier then sends a note to the buyers to confirm the new bin levels.

In IHD Ericsson uses materials such as screws, nuts, packet bands, labels and plastic bags. Characteristics of these materials are that they are standard materials with high yearly requirements, no need for quality control, fairly even consumption and a cheap price, which implies that there is no focus on capital being tied up. The items should not be bulky (voluminous) either, since the supplier must personally bring the material. Similarly, to make IHD work supplier and customer must not be too far apart. Another important prerequisite to make the concept work well is mutual confidence and trust between customer and supplier and that the parties are engaged.

One reason for Ericsson to apply this model is to avoid the need for registration of items in IT systems and not to have inventory control balances, since it is difficult and time consuming to maintain such a system for these kinds of products. No purchase orders need to be made or tracked in IT systems, and the buyer does not need to control shipped deliveries or similar activities. So information regarding inventory on hand or other issues concerning inventory control or traditional purchase activities does not exist for the concept of IHD. Also, no shipping documents need to be handled.

The design system, on the other hand, contains information on the value of the IHD products that are added to the cost of the end product. This is an average value and is a very small part of the end product material costs. Systems are still used to document economic transactions, but to a lesser extent. After the supplier has replenished the store, an invoice will be sent to Ericsson corresponding to the refilled amount. A frame order is used to handle the payment, so when the invoice arrives
the correct amount of money will be deducted. The frame order covers a period of time such as \( \frac{1}{2} \) year or \( \frac{1}{4} \) year.

5 Analysis

The model constructed from the theoretical framework will here be used to point out and analyze/discuss the characteristics of the supply model IHD, thus answering the research questions. The same main areas (numbered 1 to 4) in the model will be used here.

5.1 Product (1)

IHD items belong in the non-critical parts cell of Krajlic's matrix, since they have low economic importance and high availability on the market. Also, because these items are standard parts there is no need for acceptance control. The concept of IHD means that the supplier will visit his customer regularly in person to replenish the storeroom, but this cannot take place every day because of transport costs and other costs/activities related to the replenishment, so the bin levels have to suffice for a period of time, so that no material shortage will occur. The same reasons imply that the items should not be too bulky and should have a high yearly requirement (items with a low yearly requirement have no need to use this concept). IHD can manage irregularities in requirements, but within the limits given by the peak values forecast.

5.2 Supply control (2)

Material handling and inventory control

The supplier takes care of material handling activities for the replenishment process at his customer's plant and the material flows directly from the receiving area to the IHD store, without transactions in an IT system. To avoid interference with other non-IHD materials, it is convenient to arrange a separate storeroom for IHD materials, which is the case at Ericsson. When the production personnel later is picking from the store, no transactions are necessary. So with IHD there are no inventory balances in IT systems, only physically viewed bins. When a bin is empty, it is the production personnel’s responsibility for placing the empty boxes (or pallet flags) in the special marked area to indicate the need for replenishment. Another bin then covers the material needed until the next replenishment. This is similar to the principle of kanban, where a visible kanban is a trigger for replenishment, and according to Olhager (2000) an easy way of controlling material flows.

The bin system also automatically reduces the possibilities of material shortages. Although some screws might be scrapped or lost, the bins provide the basic data for replenishment, not figures in an IT system as is the case when calculating traditionally purchase orders with MRP. These principles are in line with what Wild (2004) points out about having simple processes to operate the inventory with efficiency.

Axsäter (1995) points out that it is generally difficult to maintain a good inventory balance and that the most usual source of error is that employees do not register transactions properly. This is one reason Ericsson is using IHD, since IHD does not require registrations. Also, this kind of material is time consuming to register and difficult to keep a correct inventory balance on.
**Pull /VMI / MRP**

How is IHD related to those principles? The principle of pull is characteristic for IHD, because no replenishment will take place unless it is necessary (if the bins are empty), so IHD is demand driven in that sense.

Regarding VMI, the characteristics are that the customer does not place orders and the responsibility for replenishment is the suppliers (Christopher, 2005). According to Mattsson (2002) different kinds of VMI designs are usually characterized by IT-based solutions regarding information exchange between supplier and customer. IHD could in contrast to this be recognized as a manual VMI solution similar to the form discussed by Mattson (2002) for its use e.g. in food stores, but for direct materials for industrial applications.

IHD is not associated with MRP, since MRP for calculating purchase orders is dependent on an IT system and accurate data concerning such aspects as inventory on hand, lead times and a BOM. Kumar and Meade (2002) state that in theory the principles of MRP would work, but in practice there are several problems because of constant changes in volume, demands for short lead times and the need for immediate delivery. Unlike MRP, IHD is easy to understand and not as dependent on data.

**5.3 Relationship to the supplier (3)**

*Information and communication*

Christopher and Lee (2004) declare the importance of shared and highly accurate information for control in the supply chain. With respect to Vigtil's (2007) emphasis on the frequency of information exchange and the supplier's need for planning, IHD fulfills these requirements. The supplier must be provided with accurate and regularly updated forecast plans, since the supplier is responsible for dimensioning the bin system (which must be synchronized to manufacturing plans) and also for dimensioning his own process. This is important for avoiding material shortage, excess inventory and obsolescence. Vigtil (2007) also declares that current inventory balance is most important regarding information; in IHD this information is observed physically, and clearly indicating actual consumption.

Concerning the relationship in a vendor managed inventory situation, Pohlen and Goldsby (2003) explain the need for trust. Trust is important when using IHD, since the supplier has access to the plant and passes through the production area, plus has the responsibility for dimensioning the store. Trust is also necessary because the manufacturer will rely on the supplier sending an accurate invoice.

*Geographical proximity*

In IHD the supplier has to deliver at a predetermined time with a limited number of replenishment occasions per year (because of the periodical system). Geographical proximity reduces disturbances such as late deliveries that possibly result in material shortages, which could, according to Christopher and Lee (2004) lead to problems drawing up an optimal production schedule. Besides that, geographical proximity is important since the supplier takes care of the transportation and will not have any other transport of cargo in return on his way back to his plant. Furthermore, it is especially desirable to keep the transportation costs low for these non-critical materials. So geographical proximity is of importance in IHD.
5.4 Logistics goals (4)

Delivery service

Lead time: Externally no lead time for traditional purchase orders exists in IHD. Instead, the supplier must follow the agreement about the time for the periodical replenishment. That is in turn dependent on the lead time for the supplier’s planning process and the lead time for the transportation. According to Christopher and Lee (2004), a longer lead time could lead to larger risks, so in IHD it is important to minimize these lead times, which could be possible with a trustful relationship and geographical proximity between supplier and customer. The internal lead time between the production and the IHD storage can be kept very small since the storage is positioned close to the production area and no time-consuming inventory transactions are necessary.

Delivery reliability: Scheduling periodic replenishment increases the possibility of reliability in lead time, since planning for the supplier becomes easier and late deliveries become more obvious. Also, the two-bin system provides correctly replenished amounts of material and an empty bin indicates a very clear need. Special marked IHD storage reduces the risks of interference with other material and putting items in the wrong places. Delivery reliability does admittedly depend on whether the production personnel fetch an amount from storage that matches the need for production.

Fill rate: The two-bin system allows for a high fill rate and the possibility for picking when needed. The idea behind IHD is that material is always available in store for production.

Flexibility: Dimensioning the bin system by peak forecast values allows for the possibility of varying or increasing the material issued from the store, yet within the limit given by the peak value. With frequent information exchange about forecast plans there are good opportunities to react quickly on volume changes. Since IHD is used for standard products, the items could be used for several end products (finished goods) which imply high product mix flexibility.

Capital tied up

Grant et al. (2006) state that reducing inventory is of great importance because holding inventory does not add value to the company. Persson (1997) similarly points out the relation between reduced inventory and reduced costs in her model. Although the literature pays considerable attention to reducing capital that is tied up, in the case of IHD this is of no interest because IHD materials are of low economic value. In addition, the idea behind IHD is that material always is available at a certain inventory level due to the periodic review system.

Use of resources

Gadde et al. (1998) imply that administrative costs and handling of materials regarding purchased products could be high even for low-cost products. But in IHD there is no need to create purchase orders, control the delivery schedule or administer orders, as is the case in MRP. Material handling is generally costly (Oskarsson et al., 2003), but in IHD these costs are low since there is no quality control, nor any use of a main warehouse and related activities there. Furthermore,
no time-consuming registrations of items or activities concerning inventory control are necessary, which in turn eliminates errors that would demand resources to handle and correct. The easy visual kanban system also reduces errors. IHD is also used for non-bulky items, meaning low demand for facilities to store equipment. In addition no shipping documents are handled. The kind of administrative resources that the customer must handle are insignificant. Since IHD could be recognized as a manual form of VMI and Mattsson (2002) implies that in most cases the costs will decrease with VMI, IHD can be expected to utilize a minimal amount of resources.

6 Conclusions

The concept of IHD is characterized by the supplier taking responsibility for the materials supply and physically visiting the customer's storerooms periodically. The supplier is responsible for maintaining and dimensioning a certain inventory level in the production store, and this occurs without any traditional purchasing ordering processes and with a low level of data involvement, unlike the case of MRP, which is very dependent on data. Moreover, IHD is a manual form of VMI but contrasts with how VMI normally is implemented in industry, where IT-based information exchange is a prerequisite (Mattsson, 2002). In IHD the inventory is controlled by an uncomplicated two-bin system without any registration of items, meaning that no inventory balances or other data concerning inventory control exists for these materials in an IT system. Furthermore the supplier has free access to the production area where the storeroom is located and brings materials with him and refills it depending on actual consumption. After this process an invoice will be sent to the customer for the replenished amount.

IHD is an interesting and uncomplicated form of VMI implemented at Ericsson. The study indicates that using IHD is not related to any particular manufacturing industry. This is partly based on that the theoretical framework and the analysis model is built upon general and well known concepts in logistics, which is used in the analysis. Thus, IHD is then not limited to only industries like Ericsson. However there are some criteria that should be in consideration for manufacturing industries when planning to implement IHD.

It is suitable to apply IHD when products are non-critical parts, standard parts with low economic importance and high consumption, as well as parts with no need for quality control upon delivery to the customer. The shape of the products is also of importance, since the items should not be bulky. Regarding the relationship between supplier and customer, it should be characterized by good communication, good information exchange and trust, all of which are important prerequisites for successful deliveries are in line with Wafa et al. (1996). Furthermore, the supplier should be close to the customers geographically.

Studies have shown that there could be some problems with MRP and that manufacturers need to question their planning system. VMI could therefore be an alternative but is usually dependent on IT-based solutions. These aspects could be reasons for companies to consider applying this IHD model for some of their products, thus IHD could be a complement to other methods for the replenishment process of materials.
IHD makes it possible for the customer to attain logistics goals like high flexibility and high availability of items in storage, with a low use of resources. The goal of low levels of tied-up capital it is not relevant in the case of IHD.

In summary, for manufacturing companies this manual form of VMI could be an uncomplicated method to manage non-critical purchased products in the supply chain with minimal resources and a high level of customer service. Using IHD could therefore be beneficial in the supply chain.

In this study there was only one company and one case handled, meaning that possibilities for comparison with other forms of VMI implementations was not the case. Comparisons could otherwise possibly possibly contribute to a deeper understanding and make the generalization more significant.

Continuing research will preferable analyse other forms of VMI solutions in other companies in order to increase the knowledge of different forms of VMI. Additionally, this study is focused on the customer’s point of view and further research should also in a larger extent include the supplier’s point of view. These issues should be subjects of further research.

References


