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Implementation of advanced inbound models

Master's thesis

Contents

Abstract

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The present Master's Thesis was assigned by company operating in telecommunications industry. The target of the Master's Thesis was to understand what the biggest benefits are in implementing advanced inbound models into use and why it sometimes takes a longer time to finalize the implementation than planned. In addition the thesis aimed at clarifying how the usage of advanced inbound models should be measured and what the key performance indicators are that can verify the information. The goal was to clarify the implementation process for the advanced inbound models and set key performance indicators to measure the success of the selected inbound models.

The research was conducted as an action research, using benchmarking to understand how the best-in-class supply chain companies are doing the same and combining that information with the target organization's own view on the needed improvements. There were four main topics that were being developed. A flexibility model was created to help choose the correct inbound model for different kinds of materials. A logistics agreement was streamlined to better support contract negotiations and advanced inbound model needs. The logistics agreement negotiation process was standardized and the key performance indicators were set to measure the usage of the advanced inbound models. The theoretical framework for the research focused on supply chain management and more specifically on vendor managed inventory.

As a result of the research, the flexibility model was taken into use, the logistics agreement was updated, the process guidelines for negotiating the logistics agreement were established and three key performance indicators were taken into a monthly follow up.

The research and its deliverables significantly improve the capabilities to negotiate and implement advanced inbound models in the target company. It also helps to understand how well the advanced inbound models are implemented in the company's supply base and that allows further analysis on their impact on inventory management and overall material availability.

Key words	Vendor managed inventory, supply chain management, negotiation process

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Tämä opinnäytetyö on tehty yritykselle, joka toimii telekommunikaatio teollisuudessa. Työssä on tutkittu kaupintavaraston etuja niin tavarantoimittajan kuin asiakkaankin näkökulmista sekä kaupintavaraston käyttöönottoon liittyviä ongelmia. Tutkimuksessa selvitettiin myös, miten kaupintavaraston käyttöastetta tulisi mitata ja lisäksi määritellä sopivat mittarit kehityksen seuraamisen mahdollistamiseksi. Päämääränä tutkimuksessa oli selkeyttää ja yhdenmukaistaa kaupintavaraston käyttöönottoprosessi sekä määritellä tulevaisuuden tavoitetasot varastoarvoille.

Tutkimuksessa hyödynnettiin sekä aiheesta löytyvää kirjallisuutta että tutustuttiin olemassa oleviin käytäntöihin toisissa kaupintavarastoa hyödyntävissä yrityksissä. Yhdistämällä saatu tieto logistiikkaosaston omiin käytännönhavaintoihin, onnistuttiin saavuttamaan parannuksia neljällä eri taholla. Ensinnäkin tutkimuksen pohjalta luotiin joustavuusmalli, jonka avulla pystytään määrittämään, minkälainen varastointimalli sopii millekin tuotteelle parhaiten. Malli ottaa huomioon tuotteen kysynnän määrän, heilahtelun ja tiheyden ja määrittää eri tavalla käyttäytyville tuotteille erilaiset varastointimallit. Toisekseen logistiikkasopimuksen luonnos, jota käytetään kaupintavarastosta sopimiseen, uudistettiin toisilta yrityksiltä saatujen vertailutulosten pohjalta yksinkertaisemmaksi ja paremmin juuri kaupintavaraston tarkoituksia palvelevaksi.

Kolmas asia, jota tutkimuksen pohjalta kehitettiin, on logistiikkasopimuksen neuvotteluprosessi. Neuvotteluprosessi jaettiin projektinhallinnan metodologian mukaisesti viiteen eri vaiheeseen, missä seuraavaan vaiheeseen päästääkseen määrättyjen vaiheiden tulee olla suoritettu. Tällä tavoin voidaan varmistaa että eri henkilöt, jotka neuvottelevat sopimuksia, toimivat samalla tavalla ja neuvotteluprosessi ja sitä kautta neuvottelutulokset ovat standardoidut. Neljänneksi logistiikkaosastolle määritettiin mittarit kaupintavarastotasojen seurantaa varten, sekä mittareille tavoitearvot, joihin tulisi tulevaisuudessa yltää.

Kaikki neljä yllämainittua kehityskohdetta on jo otettu käytäntöön. Joustavuusmallin käyttö on opetettu ostajille ja se on dokumentoitu yleisten ohjeiden joukkoon logistiikkaosaston tietokantaan. Logistiikkasopimusluonnos on lakiosaston hyväksymä ja se on otettu käyttöön uusissa neuvotteluissa. Logistiikkasopimuksen neuvotteluprosessia noudetaan kaikissa uusissa neuvotteluissa ja uusien mittareiden mukaisia tuloksia on seurattu nyt jo usean kuukauden ajan.

Tutkimuksella saavutettujen parannusten ansiosta logistiikkasopimuksesta neuvotteleminen sekä kaupintavaraston käyttöönotto on nykyisin tehokkaampaa. Määritetyt mittarit kertovat, miten kaupintavaraston käyttöönotoissa on onnistuttu ja tämä ohjaa logistiikkaosaston työtä vieläkin tehokkaampaan suuntaan.

Avainsanat	Kaupintavarasto, toimitusketjunhallinta, sopimusneuvottelut

Abbreviations

Advanced inbound model is a term used to describe other inbound logistics models than classic purchasing. In this thesis advanced inbound models cover mainly VMI and SCS.

VMI, Vendor Managed Inventory is a logistics model where supplier prepares inventory according to customers forecast and owns the inventory until the moment the customer consumes it from the warehouse

SCS, Supplier Managed Consignment Stock is one specified version of VMI where consignment is used as phrase to describe the ownership of the inventory. Used at The Company

The Company is the target organization of this thesis. Due to confidentiality the real name of the corporation is not used.

EMS company, Electronic Manufacturing Service company, a contract manufacturer who is responsible for majority of production that The Company is selling.

iHub, inbound hub, a concept that The Company uses for its inbound logistics

KPI, Key Performance Indicator is measuring the organizations performance.

1. Introduction

In this chapter I will go through the background information and motivation that are driving me to do this research. I will explain the background and the environment of the study and also the reasons why it is made. Research objectives and questions are also presented in this topic.

1.1. Background information

1.1.1. Telecommunication industry

Telecommunication industry has been changing rapidly and fundamentally in the 2000s. Driving forces for this change has been at least liberalization, deregulation and privatization of the markets together with fast technological development. Software and services are creating much more value than earlier and they have by-passed equipment at the center of value creation. (IBM Global Business Services 2007.)

Network Equipment Providers, companies that provide equipment, software and services for communications solutions need to converge with telecommunications, media/entertainment and electronics industry need to be able to provide consumer-friendly and industry-efficient crossovers, such as the provision of Internet videos on mobile telephones and MP3 music downloads. (IBM Global Business Services 2007.)

Other typical phenomenon of the 2000s is consolidation of the Network Equipment Providers. By consolidating companies are targeting to have scale advantage to-wards their competition and to be able to compete as an end-to-end supplier against their old rivals as well as the emerging players. This is also leading to fierce competition on a cost level and high pressure on profit margins that Network Equipment Providers aim at. (IBM Global Business Services 2007.)

Cost pressure is affecting heavily on average gross margins in the industry. Average gross margins have decreased from approximately 40% to approximately 30% between 2007 and 2011 (Suri 2012). During the same period of time the overall telecommunication market has been quite flat, increasing only from 113 bn€ to 116 bn€ and Chinese competitors have come aggressively to the market by increasing their market share 8% to 20% (Lyytikäinen 2012).

1.2. The Company in brief

The Company is one of the largest telecommunication companies in the world. The Company is one of the three biggest players globally on a telecommunication market and it has a strong foot print especially on mobile broadband business and network services business. It has currently more than 600 customers worldwide.

The Company has centralized operations on supply chain management area and its manufacturing strategy is to split the production between own factories and electronics manufacturing service providers (hereinafter EMS). Component purchasing is in global purchasing mode which means that one buyer is responsible for global demand for certain components. Heavier mechanical parts are instead purchased locally by each manufacturing location due to high logistics costs.

1.3. Research objective and questions

1. Why to choose advanced inbound model into use
2. What are the main obstacles in implementing advanced inbound models
3. How to measure advanced inbound models

1.4. The scope of the study

This thesis focuses on implementation of new advanced inbound models in electronic component supply chain environment. The theoretical background in higher level is Supply Chain Management. As supply chain management covers management of supply chain and its processes; planning, organizing, implementing and controlling processes, this thesis only concentrates on implementation of advanced models for incoming materials. This thesis does not focus on other processes that might be linked with the implementation of advanced inbound models but concentrates on factors that are directly impacting on implementation process.

Other theoretical framework for this thesis is the negotiation process of advanced inbound models in The Company. Existing process is seen as the basis for the study and it will be used as source information.

1.5. Core concepts and key terms

VMI = Vendor managed inventory is a model where buyer of a product provides agreed information to a vendor (supplier) of that product and gives the supplier the full responsibility to maintain the inventory on agreed level.

CW = Contract warehouse includes the shipping, receiving and storage of goods based on contract. It is usually required that customer commits to services for a certain time period. Cost structure may also vary; it may be a fixed cost, cost-plus or a combination of both

SCS = Supplier managed consignment stock is a model where supplier of the goods own the material until the moment when buyer consumes the goods from the inventory.

SCM = Supply chain management is the design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building

a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand, and measuring performance globally. (APICS 2013.)

1.6. Structure of the thesis

Chapter 1 of this thesis describes the background of the thesis; company, industry and the research problem are presented in here. In chapter 2 it is explained that which research methods are used. There are more detailed explanations for the chosen methods; action research, case study and benchmarking.

Chapter 3 includes the theoretical framework of this thesis. The focus is on the vendor managed inventory, implementation of vendor managed inventory, benefits and disadvantages of vendor managed inventory and logistics cost of the vendor managed inventory.

Chapter 4 includes the research in the selected company and chapter 5 includes the conclusions and recommendations based on the findings.

2. Methodology

2.1. Action research

Action research is a practical approach to professional inquiry in any social situation. Action research is used when some practice needs to be changed or things might not be going as they should or new initiative need to be implemented but it is unsure how to do it effectively. Action research can be used for finding practical solutions while knowing that practice is always influenced by context. Action research helps to understand the practice by finding the solutions for research problems and

also the factors that effect on the process. The aim in action research is to bring development in practice by analyzing existing practice and identifying elements for change. The process is founded on the gathering of evidence on which to make informed rather than intuitive judgments and decisions. (Waters-Adams 2006.)

In action research the researcher studies the problem systematically and ensures the intervention is informed by theoretical considerations. Much of the researcher's time is spent on refining the methodological tools to suit the exigencies of the situation and on collecting, analyzing, and presenting data on an ongoing, cyclical basis. (O'Brien 1998.)

2.2. Case study

Case study is an activity, event or problem that contains a real or hypothetical situation and includes complexities. Case studies are used in helping to see how the complexities influence on decisions. For taking advantage from a case study analysis it is needed to analyze, apply knowledge and reasoning as well as draw conclusions. A good case study has the following features:

- It is taken from real life.
- It consists of many parts and each part usually ends with problems and points for discussion. There may not be a clear cut off point to the situation.
- It includes sufficient information for the reader to treat problems and issues.
- It is believable for the reader. (Kardos & Smith 1979.)

2.3. Benchmarking

Idea of benchmarking is simple. First is needed to evaluate companies own operations, products, or services. Second is needed to identify weaknesses meaning whatever holds the organization back from achieving its goals or any other function having been identified as needing improvement. The next step is to find a few gold

medalists in the field and follow their leads. Learning from the best to maximize your own success is really what benchmarking is in a nutshell. (Cheney 1998.)

Benchmarking is an improvement process used to discover and incorporate best practices into your operation. Benchmarking is the preferred process used to identify and understand the elements and causes of superior or world-class performance in a particular work process. (Damelio 1995.)

The essence of benchmarking is discovering the root causes of superior levels of process performance. One of the first accomplishments should be to thoroughly analyze the current internal work process to be able to understand the sources of customer value that the process provides. This allows the focus to research skills, such as interviewing, writing survey questions, searching on-line databases, or reviewing existing information to discover the elements of process performance that will matter most to their own customers. (Damelio 1995.)

3. Advanced inbound models

In this chapter I will go through the theoretical framework of advanced inbound model management. The focus will be in vendor managed inventory as it has been the preferred inbound model for electronic components in The Company.

In this thesis I will do the research from vendor managed inventory point of view and in this thesis I will use vendor managed inventory (VMI) to cover also supplier managed consignment stock and contract warehouse models as they have lot of similar attributes than VMI and are in fact many times confused with each other.

Supplier managed consignment stock means that the material at a customer site that is owned by a supplier. The customer has the physical inventory at their location, but does not have ownership of the material. (Oracle 2013.)

The relationship between VMI and consignment inventory might be sometimes confusing. VMI and consignment are two different inventory strategies that are some-

times used together. VMI is more about managing the inventory that supplied by a vendor and consignment is about the ownership of the inventory. It is possible to have VMI that is not consignment inventory, it is possible have consignment inventory that is not VMI, and it is possible to have inventory that is both consignment and VMI. (Piasecki 2012.)

At The Company VMI is used when operating in consignment model and the inventory is managed by a supplier. Term supplier managed consignment stock (SCS) is quite often used when talking about VMI.

Contract warehouse (CW) is the similar kind of inbound model than SCS but the difference is that supplier has the physical inventory at their location and also the ownership of the material. Customer replenishes from the supplier's stock according to its needs. Ownership changes according to valid Incoterm.

3.1. Vendor managed inventory

In this section I will focus on vendor managed inventory, benefits and downsides of it and also the implementation and related difficulties and requirements.

Name of the vendor managed inventory is very much self-explaining, vendor is managing the inventory. And while there can be more to it than this, at a minimum this means the vendor determines when to replenish and how much to replenish. (Piasecki 2012.)

Overall vendor managed inventory is a supply chain management strategy in which a supplier manages goods that are located in a customer's warehouse. Typically the goods can be consigned or non-consigned stock. The consigned stock is owned by the supplier until the customer consumes it, and the non-consigned stock is owned by the customer when the customer receives it. (Oracle 2013.)

Target of having vendor managed inventory is to provide benefits from the relationship mutually to both sides so that they would be able to more smoothly and accurately control the availability and flow of goods. (Frahm 2003.)

In VMI a vendor takes the role of inventory planning for the customer. Extensive information sharing is required so that the vendor can maintain the best possible visibility of its goods at the customer's location. Traditionally when the customer has been reordering when its supply has been exhausted, in the VMI model vendor is responsible for replenishing and keeping the stock level in between mutually agreed minimum and maximum levels. (Frahm 2003.)

VMI is times used in cases where it is not important for customer to have responsibility for stocks of materials or pre-products themselves. Therefore the inventory management moved to the supplier, who usually handles it on the basis data that they get from the customer. VMI is often operated in consignment stock model. The ownership of stocks remains at the supplier side until the actual need for consumption takes place. VMI arrangements are especially suited for merchandise stocks with predictable, relatively high consumption rates. (Oracle 2013.)

As can be seen from above explanations there is not one correct way of operating in VMI but many different variations from where customer can choose the most suitable one for its own needs. Dave Piasecki lists in his article few most commonly used options:

Vendor shows up at customer's facility, physically reviews inventory levels, immediately replenishes with inventory he has with him (actually physically stocks the inventory on the customer's shelves).

- Vendor shows up at customer's facility, physically reviews inventory levels, and places an order for replenishment inventory that will be delivered at a later date. Depending on delivery method, the vendor may do the physical restocking, or may leave it for the customer to do.
- Customer periodically (daily, weekly, etc) provides vendor with current inventory levels. Vendor reviews inventory levels and creates replenishment orders. Replenishment orders are shipped to customer. Customer performs all physical tasks related to the inventory at his facility.
- Vendor has direct access to customer's inventory system and can get real-time in-formation related to on-hand levels, open orders, forecasts, production schedules, etc. Vendor makes replenishment decisions based on this data and ships orders to customer.

- Vendor provides on on-site inventory planner that works full-time at the customer's facility managing the inventory supplied by that vendor.
- Vendor leases space within the customer's facility and run's their own warehouse and inventory planning operation with their own employees from within the customer's facility. (Piasecki 2012.)

3.2. Implementation of vendor managed inventory

When company starts to plan establishing a VMI they need to clarify their expectations. Very thorough discussion about how the system will benefit both of the organizations, customer and supplier, in the long term is needed. On a short-term all the benefits may not be visible so lot of patience is needed. The key to success is clear and constant communication between the supplier and customer. When these two parties are working in conjunction they can be assured that the planning function, for both sides, will begin to work smoothly over time. (Frahm 2003.)

Another very important thing is to agree on how to share information. If the supplier and customer can agree about punctual information sharing related to restocking, the odds of a synchronized system will increase significantly. All the available information would not have to be shared between the supplier and customer, but enough information to maintain a steady flow of goods is necessary. The customer should be willing to share production schedules and/or forecasts to provide some visibility for the supplier. (Frahm 2003.)

When the expectations are clear and information channels are in place it is utmost important to keep communication channels open. Both of the parties need to meet and discuss their goals and how they need to proceed in order to realize those goals often enough. Once a VMI program has been activated, both sides need to understand that eventually there will be some errors. These errors need to be studied as opportunities for learning and then used to avoid repetitive problems in the future. (Frahm 2003.)

Most important thing when implementing VMI is mutual trust between the customer and vendor. According to Oracle's PeopleSoft Inventory there are seven steps that any company should take into account when implementing VMI.

1) Define the parameters: The more carefully parameters are defined for each situation, the more successful the implementation of VMI (safety-buffer stock, minimum size of delivery batch, etc.).

2) Specify prices for vendor managed inventories: VMI pricing must reflect the true costs to the supplier. This also indirectly determines the value of financial benefits.

3) Exploit an opportunity for supplier consolidation, since greater volumes with one supplier are more likely to produce meaningful VMI arrangements.

4) Share responsibility for designing the process: A VMI model requires close cooperation and complete disclosure of information by both sides.

5) Introduce key performance indicators (KPI): These indicators will promote cost reductions in spite of high service levels (e.g. forecasting accuracy, warehousing bottlenecks, etc.).

6) Introduce a forecasting model: Introduce a forecasting model based on historical data that factors in seasonal and other influences.

7) Buyback of stocks: To start a program of vendor managed inventories, the supplier should buy up all existing stocks. (Oracle 2013.)

Through more and more advanced inbound models the leading companies in this area are moving rapidly toward what becomes a value managed enterprise and a dominant position in an industry, while many of their competitors remain being stuck in the early levels of their supply chain progression. The leading companies are moving their supply chains into a position of having superior capabilities, gained by having greater access to knowledge across. This leads eventually into an intelligent value chain network. The difference for these businesses can be a doubling of earnings per share. The laggards and followers tend to keep their focus on internal

improvement only, especially on lower costs of operations. Even though the cost orientation will not go away, there should still be an equal and pervasive effort to generate the new and profitable revenues for the customer and end customer. Especially there must be a methodology in place to track the claimed improvements to the profit and loss statement, and there should be documented benefits for those members of the network that assist in the improvement process. (Poirier & Walker 2005.)

Poirier and Walker are describing how a company can take steps to a desired state at the business through a supply chain maturity model. In this model they describe the typical progression, through which a firm evolves on its way to the most desired advanced level of implementation. The model is also useful to calibrate a company's position as it moves forward and to determine to what level of progress the company should aspire. It is important to understand that a company must progress through all the levels and none of them can be skipped. (Poirier & Walker 2005.)
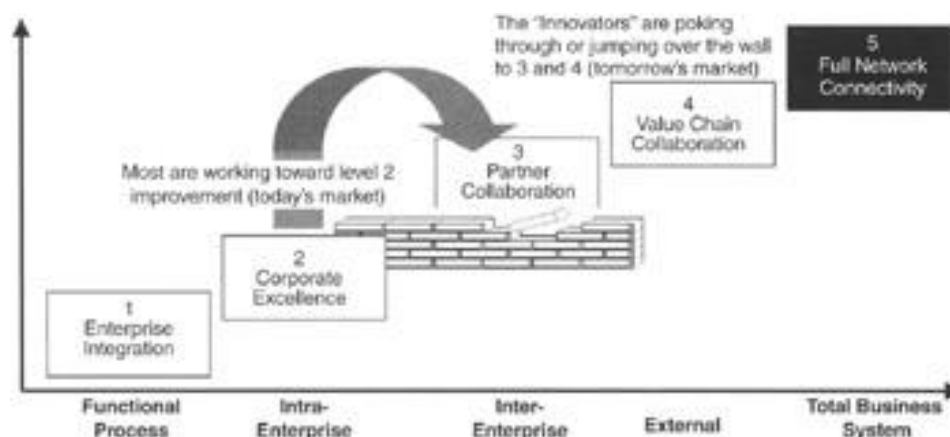
On a first level of the progression, the company begins to focus on functional processes, mainly sourcing and logistics. In addition to using these two areas of attention to gather early improvement and quick profit gains, a secondary goal is to bring enterprise integration into focus as an objective. There are usually significant savings generated during this first part of the evolution. With a lesser number of sources providing larger volumes, prices are reduced and added features introduced into the relationship. Typical benefits add one or two points of profit, because the amount of total purchases is often as much as 40 to 50% or more of the costs

of goods or services sold. Additionally most companies begin to pay more attention to how purchased goods are brought into the supply chain processing, how material and supplies are handled internally, and how finished products and goods are delivered to the next company in the linked processing. That means a focus is brought to inbound freight, internal material processing and manufacture, outbound freight, and the warehousing and delivery mechanisms necessary to support the logistics system. (Poirier & Walker 2005.)

On a second level sourcing and logistics move to a higher level as the firm begins more intense work with the key suppliers and transportation providers. Planning becomes an important effort. A supply chain infrastructure begins to appear during this level. Establishing an order system that eliminates manual errors and mistakes is crucial and becomes a requisite for level 2 progress. With increasing planning activities, some form of sales and operations planning (S&OP) is generally introduced to require the company to have a formal process for analyzing the orders, the production process steps, and the final delivery to customers. Forecast accuracy becomes an internal issue. In the second level, companies also turn their attention to the matter of inventory management. Much effort is expended to reduce the amount of cash tied up in inventories, however large amount of the inventory is simply moved upstream, toward obliging suppliers, rather than taken out of the supply chain As the suppliers are most probably smart enough to cover their carrying costs in the total price for the delivered supplies, it means that the assets and costs are moved, rather than eliminating the need for extra inventory and safety stock. (Poirier & Walker 2005.)

On a third level the company begins to very selectively choose business allies to advance the supply chain improvement effort on a network basis. Forecasting and planning go through another improvement cycle as companies begin to collaborate to match actual demand signals with production and delivery capacity. A form of advanced planning and scheduling is typically introduced in this level. The concepts are basic, but implementation is difficult, as many companies resist turning over responsibility for any processing to external organizations, even when the data verify the higher capability. The process maps describing the supply chain steps are viewed extra carefully to find out how the business allies can reach mutual benefits. The key in this area is to make certain that the discovered savings are shared in

some way between the parties to the effort. Distributors can play a key role in this area. (Poirier & Walker 2005.)

On a fourth level the supply chain constituents are working closely together, sharing knowledge across a communication extranet and collaborating on how to increase revenues and better utilize combined assets, as well as finding further cost and service improvements. New KPI's are introduced to measure performance, with most of the measures focused on customer or consumer satisfaction. This is truly the realm of the intelligent value network where the savings can reach as high as five to eight points of new profit. The fifth and final level is more theoretical than actual, with only a handful of companies achieving full network connectivity. That term is used to describe a condition in which the linked organizations are sharing virtually all of the important data electronically and are working together through some form of cyber communication system. (Poirier & Walker 2005.)

Some of the biggest mistakes that would need to be avoided are e.g. unexpected demand changes by the customer which would need to be shared with the supplier immediately. The supplier may be unable to schedule production or shipment in a timely manner, causing a drop in inventory available for the customer to sell a foreseen increase in demand. A spike in demand could also create a burden on the supplier, who will have to reprioritize its production plan or inventory from one customer to another. Likewise, if the supplier is experiencing a significant spike in demand from a major customer, it may be wise to let the VMI customer, and other customers as well, know that the supplier will have very little flexibility over a certain period of time, so that everyone can adjust accordingly. The most common cause of VMI failure revolves around communication breakdowns. (Frahm 2003.)

3.3. Benefits of vendor managed inventory

Benefits of the VMI can be seen from both, customers and suppliers point of view. From the customer's perspective, if the vendor can actually manage their inventory better than them, VMI can be an effective option in both increasing their inventory management effectiveness and reducing their costs associated with managing this inventory. Or, as long as the vendor can do at least as good of a job as the cus-

tomer was doing, there is still savings on the customer side related to not having to manage the inventory. (Piasecki 2012.)

When the supplier can see that its customer is about to exhaust its inventory, the supplier can better prepare to replenish the customer because the supplier can then better schedule its own production. Customers will reduce stock outs because they will not have to reorder goods at the last minute without knowing whether the supplier has the ability to restock without interrupting the customer's operations. Therefore, part of VMI's goal is to reduce uncertainty that arises when the supplier is blind to the customer's inventory status. (Frahm 2003.)

From the suppliers perspective there is lot of potential to reduce lost sales due to stock outs, reduce your safety stock levels by having more control over shipment quantities and times to your customer, and prevent excess and obsolete inventory due to customer errors. In case supplier can get access to customer's planning data, they can potentially use that to better plan their inventory levels. VMI also increases supplier's possibilities to supply all products within a product group. It also makes it more difficult for the customer to change suppliers since they would need to either find another supplier that can do VMI and work out all the details, or they would need to take the responsibility themselves. VMI also gives the supplier more control over their shipping schedule since they will be determining when orders are placed. (Piasecki 2012.)

When the supplier is carrying out its task of maintaining predetermined inventory and avoiding stock outs, it will be able to lock in a VMI supported customer for the long term with or without a contract. This will produce a steady and predictable flow of income for the supplier and reduce the risk that the customer will switch suppliers. VMI arrangement will allow the supplier to schedule its operations more productively because it is now monitoring its customer's inventory on a regular basis. Over the time supplier also learns how the customer behaves and it can utilize that information in own planning. (Frahm 2003.)

3.4. Downsides of vendor managed inventory

Possible downside can be e.g. if the supplier is worse in managing the inventory than the customer. That should be avoided with proper preparations and pre-work. And it is more difficult for a customer to change suppliers once VMI has been implemented. That would require money, time and effort to replace the VMI supplier. (Piasecki 2012.)

3.5. Logistics cost

In most of the cases there are several suppliers and also several manufacturing sites at the customers end so using third party logistics service provider (3PL) for operating the warehouse. Customer doesn't need to have its fixed logistics department if they operate with the 3PL. The 3PL model is driven by the volume of cargo moved with the designated service provider. Because the 3PL company's costs are built into the rate structure offered to the customer, in practice payroll and other operating expenses shift to the 3PL company. In more evolved relationships, customers have enlisted the services of "in-house" personnel from the 3PL firm. In such cases, the 3PL company provides employees to work at the customer's location, facilitating and oftentimes running the entire logistics operation. In this practice an organization typically divest itself of its own human capital. As is more consistent with lean thinking, smarter companies will retain an element of their international talent pool to work with suppliers on managing relationships and continuous improvement initiatives. If a company does not have a commensurate amount of global experience on staff, it may compromise internal communication channels, miss shared learning opportunities or simply become too dependent on a service provider. (Gardner 2004.)

Besides the payroll benefit gained by using the 3PL, the other important advantage of using 3PL is improved communication. Even with e-mail and instant messaging, there are a colossal number of telephone calls and faxes moving across supply chains. This is not small change to companies, and the ability to use 3PL firms to communicate on their behalf is a feature of the relationship with which customers are quite happy. That "extra set of eyes" quickly becomes a vehicle for international communication, saving customers the time and expense of addressing logistics-

related issues with clients, suppliers and strategic partners around the world. (Gardner 2004.)

4. Advanced inbound model implementation in The Company

4.1. Current state of VMI in The Company

When starting the thesis the VMI set up is known and also commonly used in The Company. Practically all VMI agreements are handled in the two inbound hubs (iHub), one located in Finland and the other one in China. VMI's are called supplier managed consignment stocks (SCS) which is mainly describing the ownership of the inventory. Suppliers are delivering materials into iHubs and they remain to be owned by the suppliers until the moment of consumption. The Company still keeps the goods that are stored in the iHub visible in their own book keeping.

IHubs are operated by the third party logistics service providers (LSP). There is different LSP in each location. LSP's are managing inventory at their own facility but they are operating the material flow in The Company's ERP system. That is how The Company has the visibility in to the inventory and it also reduces the risk for human mistakes when the data is not needed to be transferred between different systems. The Company's buyers are responsible for purchasing the materials in to the iHubs globally. The Company's manufacturing sites are thereafter able to make replenishment orders from the iHub in to the manufacturing location.

Logistics agreement is negotiated between The Company and the supplier by the inbound supply chain team and the negotiations are finalized together with global procurement (GPR) category manager who owns the purchase agreement whereto the logistics agreement is one appendix. Together with the logistics agreement also logistics services agreement (LSA) is negotiated. It is a pre-negotiated agreement between The Company and LSP and it covers the roles and responsibilities between supplier and LSP. The Company's inbound supply chain team member ne-

gotiated this agreement with the supplier and after agreement is found it becomes a contract where the supplier and LSP are the contract parties.

In logistics agreement The Company and supplier are agreeing on the terms and condition on which the advanced inbound model, typically SCS or CW, will be operated. Product prices and other related purchasing topics are agreed on the purchase agreement so logistics agreements main purpose is to cover advanced inbound model related topics such as liabilities, delivery details and roles and responsibilities.

Basically only thing that is measured is the amount of the suppliers who have signed the logistics agreement so how many suppliers are operating with the advanced inbound models. Prioritization is done pretty much based on the gut feeling meaning that form the history people know that which suppliers are important and which are wanted to have using advanced inbound models. Metrics behind are not utilized at all.

4.2. The scope of items in iHub

When launching the iHub concept in 2007 it was planned that iHub itself and advanced inbound models could be taken into use with basically all materials that are used in manufacturing process. Quite soon it was anyway obvious that transporting large and space consuming elements and heavy weighted items is not logistically and economically benefitting. Therefore such items as enclosures, cabinets and mechanics have been out scoped from iHub.

Other product category that has been found challenging from iHub concept point of view is printed wiring boards (PWB). They are quite heavy items but the major problem is that the boards get old in the warehouse rather quickly. Therefore the inventory should be rotating really quickly too. Other as important problem is the return cycle of the PWB's. If there is a need to return faulty units to supplier the return cycle could not go through iHub as typically the PWB is assembled right after the delivery to manufacturing location and from the system point of view it is not any-

more the same product and therefore the traceability of the original item is impossible.

Also all the additional manufacturing equipment with very low value such as bolts, screws etc. is easiest and cheapest purchase locally. Basically all other components that are used in The Company's own manufacturing have been available to be purchased centralized via iHub.

4.3. Key performance indicators

In the starting point when the iHub's where first implemented the idea provided by the consultant company was that 80% of each suppliers spend is calculated to be in SCS model. So the rough calculations were made based on that assumption. That didn't take too much into account different kind of variations and specialties that different suppliers might have.

Also it was originally thought that basically all the suppliers would be implemented into iHub and into SCS model. Calculations didn't take into account the different kind of materials which might not be suitable for this kind of inbound model or the willingness of the suppliers to operate in such a model. At the beginning the plan was to have more iHub locations to better be able to support different regions more locally. In practice the amount of iHub's stayed in two and their role has been more global.

The nature of a telecommunication business is that much unique that not all the theories that the consultant company had used are working in real life. Especially different material categories are not working similar way with each other. The forecasting of the end product volumes is very challenging due the high mix-high complexity type of business. That means that there are quite many variants of end products and they are relatively complex to manufacture. Therefore managing the inventory levels is challenging.

We have listed the suppliers who are delivering materials to The Company and have from purchasing team's point of view significant enough importance to us and

based on that list we have negotiated the Logistics Appendixes with them. KPI for that has been that negotiations or the supplier's willingness to negotiate has been asked from all the suppliers and then the supplier list has been created accordingly.

We have measured spend of the materials that are on SCS model and compared that to total spend of iHub materials. There we have got the ratio of SCS items. As the only benchmark what we have had related to share of SCS items in iHub is coming from the consultants that originally sold the model to The Company we highlighted that as one of the topics we liked to benchmark from the EMS companies. Other KPI's have not been followed related to iHub and SCS implementations.

4.4. Logistics agreement

Normally The Company and supplier agree a purchase agreement about general terms and conditions of purchasing. Purchase agreement is automatically including the most common purchasing method, Classic Purchasing (CP) where buyer places purchase order to supplier and based on that supplier ships material to buyer's location. Logistics agreement is an appendix to purchase agreement and it is needed in case advanced inbound model is taken into a use. Most commonly used advanced inbound model is supplier managed consignment stock but also contract warehouse is used time to time.

Logistics agreement that is in use at The Company is quite long and complicated. It is altogether nine pages long and includes six separate annexes which are:

- Local annex
- Documents and reporting requirements
- Standard logistics services
- Supplier Account information (self-billing)
- Advanced shipping notification
- Demand and consumption commitments

Being able to find an agreement with supplier about some topic doesn't necessarily mean that parties have found an overall agreement but more likely the negotiations continue with other documents. This is confusing and time consuming.

Main obstacles that have been found during the contract negotiations with the suppliers vary a lot depending on the supplier. Very often supplier sees advanced inbound models as a way to transfer inventories from buyer to supplier. Suppliers are claiming that only aim that The Company is targeting is to have similar kind of availability than earlier but without having cost over inventory. Others have understood the benefit what they can gain by having better control over their own supply chain. These models give suppliers more flexibility to plan their own supply chain and manufacturing according to their own needs. And The Company is carrying its part of the risk by giving ageing liability to supplier. Ageing liability means that buyer commits to purchase all the materials from consignment stock if they have not been rotating in given time period e.g. 90 days. That is clear improvement to CP model where buyer has been entitled to cancel the whole order within the agreed cancellation period.

The Company has organized its manufacturing so that Electronic Manufacturing Service (EMS) companies are responsible for major part of the volume production. In this setup The Company has designed the product but companies that are focused only on manufacturing will take care of that. They are responsible for purchasing the needed components by themselves but they can utilize the purchasing prices that The Company has negotiated. Therefore some component suppliers are not willing to start to operate in iHub as major part of their volumes are going actually to EMS companies even though it is seen as The Company's demand. The Company it routing few of the most expensive and most critical components via iHub also to EMS companies but due to the technical limitations is not able to take all the wanted volumes to that model.

Other thing that is causing different opinions between suppliers and The Company when negotiating the Logistics Agreement is how different parties see the customization rate of the components. The Company is offering in the agreement some liability to components but that is usually meant for the components that are customized for The Company's products. Only in few occasions liability is offered also for standard components and in these case the size of the liability is also smaller. From The Company's point of view the risk of lost business is not as big in case of standard components as they could also be sold to other customers that The Company should not be forced to carry the extra liabilities. Several suppliers are still claiming

that even though the component is standard in that sense that it could be used by other customers as well, The Company is in practice the only customer that they have.

One of the most often heard complain is that The Company's forecast for upcoming demand is so uncertain that operating in SCS model is not possible without, of course, very big liabilities given by The Company. As in SCS model suppliers are responsible for optimizing their supply chain based on the forecast of demand provided by The Company they feel that it doesn't give accurate enough figures for them for their planning purposes.

Some component suppliers, especially those ones who are manufacturing most complex components, are very large from net sales point of view or are operating fully based on make-to-order methodology, refuse to start consignment stock model as they are not doing that with any of their customers. They have selected their way of operating and are not going to change that even though The Company is purchasing quite significant volumes and can show that the model is working with other suppliers. This denial will of course be taken into account when selecting the suppliers for future businesses but some suppliers have such a position on the markets that they will be selected with a high probability also in the next round. And they know it.

Product total cancellation is a specific topic on Logistics Appendix which is many times slowing down the negotiations as it is seen too confusing by the suppliers. Purpose of the clause is to give some liability to supplier in case The Company suddenly and without a prior notice would stop ordering specific component and supplier have already manufactured it according to provided forecast.

4.5. Third party logistics

In the starting point The Company is having two iHubs, one in Vantaa, Finland and one in Suzhou, China. Both of the iHubs are operated by external Logistics Service Provider (LSP). To make sure that cost of the service can be evaluated objectively each iHub is operated by different LSP. Both of the LSP's are familiar to The Com-

pany from other warehouse service businesses so the activities can be compared quite easily.

Using third party logistics LSP is based on the strategy that The Company is having for its supply chain management. Outbound distribution has already earlier been operated by the external LSP's and the same format has been taken into use with inbound logistics. Reason for that is that The Company is focusing its energy more to developing and manufacturing products and leaving warehousing activities be taken care of by professionals in that area. Detailed business case calculations have been made that what is the benefit of that knowledge and personnel in The Company instead of purchasing the service from the LSP's. The result has been that cost and gain of service is on such level that it is beneficial to purchase that from service providers instead of doing everything by oneself.

LSP's are only taking care of the warehouse activities. The Company is responsible for negotiating component prices and inbound models, purchasing and distribution. LSP's are responsible for receiving the goods, storing them and shipping to the named destination. LSP's are managing the goods in The Company's ERP system and the goods are owned either by the supplier (in VMI model) or The Company (in Classic Purchasing model).

Which iHub is used is being defined by the region from where the supplier is delivering the components into the iHub. Components that are manufactured in Asia are typically delivered to China iHub and the components that are coming from either Europe or America are delivered through Finland iHub. Due the nature of the industry this leads to situation where on one tenth of a volume goes via Finland iHub and nine tenths of the volume via China iHub. Monetary wise there is not such big difference between two iHubs as there are some high value components that are operated through Finland iHub and therefore the spend deviation is almost half and half.

4.6. Benchmarking at Sanmina & Flextronics

In order to get better understanding how other companies in similar kind of industry are handling their inbound supply chain I wanted to have an insight to their ways of working. I got a chance to do benchmark at two major EMS companies at their facilities in Guadalajara, Mexico. The EMS companies are US origin Sanmina and Flextronics, both also contract manufacturers to The Company.

I visited the sites with two of my colleagues for all together four days. We did walk through in both of the sites and were given presentation about their inbound processes. As they are The Company's service providers we were able to get also quite confident information because it is evident for them that if we are able to improve our inbound models it benefits also their needs. So this was really a win-win situation, keeping of course in mind that business needs to be profitable for all parties.

One of first topics that I clarified was which inbound models they are using. There was actually no big surprises in this area as the most commonly used models were basically the same than what The Company is using. VMI model and Contract Warehouse model were also used by both EMS companies. One of the differences was the usage of so called distributor companies. In this set-up part of the purchasing responsibilities, typically very standard type of components with very low purchase value, is given to a company which is specialized on buying and selling of these kind of components. Idea is that distributor is charging certain mark-up on each purchase lot but when they are buying big amount of components to several different customers, their price might still be competitive compared to the situation where customer would need to do all the transactions by themselves and have all the related persons hired in their head count. This is that kind of a business model that The Company has decided not to use but they rather have full control by themselves to the whole supply chain.

Other bigger topic was finding out how the EMS companies are deciding which components are in scope of each inbound model. There was no major breakthrough in this are either as it seemed that they are doing it pretty similar way than The Company. Most critical components with highest value tend to be taken into VMI model and suppliers who are not willing or capable to operate in VMI model are preferring CW model. Additionally to classic purchasing the EMS were then using distributors which could work in any of the three models, VMI, CW or CP. Other

difference to The Company's way of working was that EMS companies offered to their suppliers Third Party Logistics service providers (3PL) warehouse which they can use at their own expense for deliveries to EMS factories. Reason for this was geographical, 3PL warehouse was located at the US side of USA and Mexico border serving those American suppliers who didn't have possibility or willingness to deliver their goods to Mexico. EMS companies then took care of the consolidated deliveries from warehouse to their manufacturing site.

Also how the companies are deciding that which components are taken in to advanced inbound models is much more sophisticated than what The Company is having. Both of the companies are having applications that area doing calculations over standard deviation which the components are having and based on those calculations the decisions are made. At The Company the decision making process is basically all manual.

Both of the EMS companies were also kind enough to show which kind of logistics agreements they are using with their suppliers when negotiating the inbound models. Biggest finding in this area was that both of the companies have much more simple agreement than what The Company is having. Where The Company as an agreement that is nine pages long and includes six different annexes, EMS companies both had very streamlined contracts containing only the necessary terms and conditions. Especially how the EMS companies were agreeing on liabilities, flexibilities and ageing clause was eye opening. Especially Sanmina's way of agreeing all these details on local annex for each component separately was something worth to proudly copy. The Company's way of agreeing has been so that liabilities, flexibilities and ageing clause have all agreed on a separate annex and they have then been the same for all the materials that the supplier is providing. By adding these details to local annex and allowing them to be negotiated on a component level we can get much more flexibility on negotiations and much more customized contracts can be negotiated. This type of way of working allows negotiation parties to agree different rules for different kind of materials. This is something that The Company has been missing and suppliers have been hesitant to agree on terms and conditions.

Last bigger theme that I wanted to find out was that how do they measure the inbound models and which kind of KPI's they have for that. In this area there was

maybe not so much new as I would have expected but everything was done in very structured way and that is something where we can improve our way of working. KPI's were pretty similar to what I had planned also for our own use. Key finding was that neither the EMS companies didn't see it realistic to have everything e.g. in VMI model. That is a request that quite often is asked that why can't we place everything in to VMI model. Both of the EMS companies had a target of having up to 70%-75% of spend in advanced inbound models.

4.7. Benchmarking at Kemppi

Other benchmark that I got a chance to make took place at Kemppi in Lahti, Finland. Kemppi is a leading manufacturer of electric welding machines and related products. Compared to The Company Kemppi is much smaller and having different kind of set-up in their manufacturing landscape by having only one global manufacturing site. Still there are enough similarities so that it made sense to make a deep dive on how they have orchestrated their supply chain.

Kemppi, like The Company, has established inbound hub to buffer the incoming materials. Kemppi is able to operate this on daily basis as their manufacturing site and hub are located on little bit more than 10 kilometers away from each other's. Other significant difference is that Kemppi has decided to place all their incoming materials to flow via inbound hub. This is possible as it is not causing any additional transportation. Inbound hub is also operating in VMI model and warehouse is operated by 3PL.

Kemppi has done the process developments in couple of previous years so the findings out of end results are brand new. The improvements in material availability, on-time delivery accuracy and savings in inventory carrying costs are exactly the results what The Company is also expecting to have.

Kemppi has been able to reduce the buffer stocks in all parts of the supply chain by starting to use VMI model in inbound hub. And by removing the safety buffers from manufacturing site they have actually been able to release more floor space for

manufacturing purposes rather that keeping warehouse inside of the factory. This has given possibility to increase the manufacturing capacity without needing to invest to new manufacturing space. They have also been able to release more cash from not having the money tied up with the raw materials at the end of the supply chain but rather having smaller inventories in the earlier part of the chain which can be refilled more frequently according to demand.

The biggest finding from benchmark at Kemppi was that the approach that The Company has chosen really can bring benefit to the supply chain management and thereafter to the whole business. At Kemppi I was able evaluate the whole process and compare it to The Company's process from the beginning to an end, only in smaller scale.

5. Conclusions

5.1. Metrics

Measuring the share of items that are SCS model is one of most visualizing KPI when measuring the implementation of such model. Share can be calculated either from the spend point of view meaning that how big is the monetary value of codes in SCS in relation to total volume or it can be calculated from the number of components in SCS in relation to total number of codes. In The Company it has been decided to measure the SCS share from spend point of view. Target setting was done based on the benchmark from the EMS companies. Original target that the consultant company was selling to The Company was 80% from the spend but the practice and also the feedback that was gotten from the EMS's showed that 75% share from spend is better. This KPI drives the implementation of CSC codes to right direction as it favors the implementation of high value codes which impacts positively on company's cash flow as was stated in this thesis' theory part. Due to some very challenging business cases the status of this KPI was 62, 1% by the end of 2015. Corrective actions are on place and the target for 2016 is still 75%.

Total number of codes in SCS model was also set as one of the KPI's. Instead of measuring the share of SCS codes we decided to follow the continuous development of total number of SCS codes. Only measuring the share of SCS codes from total number of codes doesn't give full picture on advantages that implementing SCS codes gives to The Company. Monetary share of codes shows that the codes that are mostly benefitting The Company's financial result are included but as mentioned in this thesis' theory part there are also other aspects of implementing SCS than only monetary benefits. Also lot of low value codes which have very high volumes are supported to be implemented to SCS modes as this is reducing manual work significantly as no purchase orders are needed. Therefore we wanted to follow steady growth of number of codes in SCS model. KPI was set to have 20 new codes on a monthly basis on SCS model so that in the end of 2015 we would have totally 850 codes in consignment. End result exceeded the target by 68 codes. Target for 2016 is still to increase number of SCS codes by 20 each month.

Additionally we wanted to have better visibility on how much we are focusing on right materials other than monetary point of view. For that purposes we took The Company's top 100 sales items and broke their bills of materials on component level and compared both SCS and CW codes to that number. That is how we created 'advanced inbound models share per top 100 sales items' KPI. This is something which had not been measured earlier so setting the target was challenging. Starting point in first half of 2015 was 7, 5% so there was only one direction and that was up. Management wanted to set ambiguous target of 20% coverage but correlating that target to target of total number of SCS code we decided to add there some scale so that minimum target was 16% and maximum was 24%. Result by the end of 2014 was 16, 8%. Target of 20% continues for 2016.

LSP cost in iHubs is also measured on monthly basis. There is not any targets given to what the cost level should be but information that is gathered from that follow-up has been very useful in developing the operations of two iHubs.

5.2. Flexibility guidelines

Based on the evaluations it was found out that it was not clear for everybody that who the flexibility guidelines should be utilized and which inbound model should be used with different kind of scenarios. There for a following kind of guideline was created:

	X	Y	Z
A	SCS		CP
B		SCS / CW	
C	SCS		CW
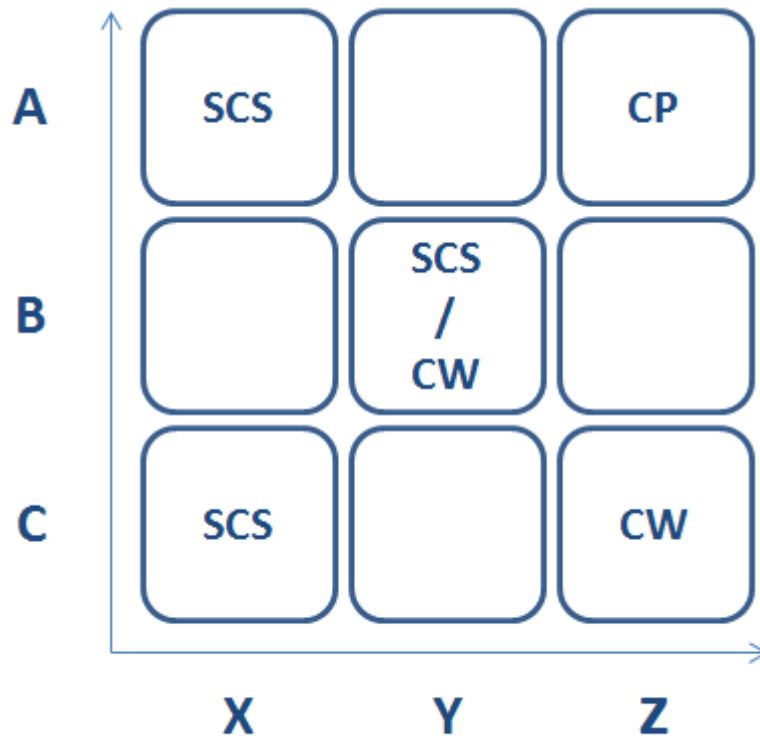
In this picture A, B and C represent spend so that A is high spend, B is mid spend and C is low spend. X, Y and Z represent demand volatility in a similar way; X is low, Y is mid and Z is high volatility.

SCS = Supplier managed Consignment Stock
CW = Contract Warehouse
CP = Classic Purchasing

	Spend	Volume	Demand Volatility	FLEXIBILITY			Cost Drivers
				ST	MT	LT	
AX	High		Low	SCS	Forecasts commitments and QC	Capacity booking (sole source) / QBR forecast update (Mx source)	
BX	Med		Low	SCS	Forecasts commitments and QC	Capacity booking (sole source) / QBR forecast update (Mx source)	
CX	Low	High	Low	SCS	Forecasts commitments and QC	Capacity booking (sole source) / QBR forecast update (Mx source)	
AY	High		Med	SCS	Forecasts commitments and QC	Capacity booking (sole source) / QBR forecast update (Mx source)	
BY	Med		Med	SCS / CW	Forecasts commitments and QC	Capacity booking (sole source) / QBR forecast update (Mx source)	
CY	Low		Med	CW	N/A	N/A	
AZ	High		High	CP	Volume commitments and QC	N/A	
BZ	Med		High	CW	Volume commitments and QC	N/A	
CZ	Low		High	QB	N/A	N/A	

ST = Flexibility created by logistics concept and metrics model

MT = Flexibility creation on lead times reduction (raw material buffers)

LT = Flexibility creation by capacity extra allocations

5.2.1. Selecting the correct inbound model

Based on the volume and demand volatility there are some basic guidelines on which inbound models can be used. Of course the nature of business and under-standing of supplier's behavior need to be taken into a consideration each time when choosing the suitable inbound model.

Supplier managed consignment stock is a recommended inbound model in cases where demand volatility is low. SCS is also recommended when demand volatility is medium and if the spend is high. When demand volatility is medium and spend is low, Contract Warehouse is the recommended inbound model. In cases where de-mand volatility is medium and also spend is medium, either SCS or CW can be used.

CW is a recommended inbound model when demand volatility is high and spend is medium. If both spend and demand volatility are high, the recommended inbound model is Classic Purchasing. If both spend and demand volatility are low, the inbound model should be evaluated at the quarterly business review (QBR) meetings.

Key considerations for defining volatility and component's suitability to advanced inbound model are:
- High volume
- High spend
- Rolling forecast existing
- Minimum one pull per month
- Consumption at least 6 MOQ per year

5.2.2. Selecting midterm flexibility model

When considering midterm flexibility model there is basically one option which is forecast commitment. This applies when demand volatility is low or when demand volatility is medium and spend is high or medium. When demand volatility is high and spend is high or medium also volume commitments can be utilized. If volume is low the midterm flexibility model is not needed if demand volatility is medium or low.

5.2.3. Selecting long term flexibility model

Long term flexibility can be considered when demand volatility is low or when demand volatility is medium and spend is high or medium. In case of sole source components capacity bookings are possible. With other components and items QBR forecast update is enough. Long term flexibility models are not needed when demand volatility is high or when demand volatility is medium and spend is low.

5.3. Logistics agreement

Based on own experiences and also the feedback that was gotten from the benchmark we decided to do a facelift to our logistics agreement. Old one was just too long and complex so it needed to be streamlined. We did that together with legal department who made sure that all the sentences are in accordance to our legal policies.

We decided to have only one contract template for all different inbound models whereas earlier we had one for SCS, on for CW and plenty of individual templates for others. In the new template there are all the models and their specific needs described but when negotiating only the needed model is left on the template and others are removed. This makes it much clearer for everybody when discussing about logistics agreement we can refer only to one document.

Also the length of the document was something we wanted to change. As the old agreement consisted of nine pages and six annexes (Local annex, Documents and reporting requirements, Standard logistics services, Supplier Account information (self-billing), Advanced shipping notification and Demand and consumption commitments) we ended up with a new template into six pages without inbound model introduction and only three annexes which are:

- Local annex
- Standard logistics services
- Liability annex

This also clarifies the entire picture for all the parties as everything can be found from the place.

One specific thing that we took from the benchmark was moving the aging liability, liability levels and flexibility levels into annex 1 where all those can be agreed separately on a component level. This gives much more flexibility to negotiations and also allows more customized contracts to be negotiated. In many cases suppliers have not been willing to negotiate the same terms and conditions for all their components so this will bring a solution to that problem.

Being able to remove three annexes is possible because some of the processes have been changed since the old template was created and not all the topics need to be agreed in similar way anymore so we were able to embed the same info into agreement body. Some other topics have been combined to three new annexes. Also by having less annexes we gain more clarity and hopefully also save some time in negotiation process.

5.4. Negotiation process

Being able to standardize the work that is done by many different people we decided to create process description and guidelines for negotiation process and tie some of the key actions with project management methodology milestones.

5.4.1. Project milestone 1

Indication for new needed logistics agreement comes typically either from purchasing team or from GPR category manager. First thing to do is check with the GPR category manager whether the supplier as an existing purchasing agreement in place and how big is the purchasing volume of the supplier. If the purchasing agreement doesn't exist neither the logistics agreement can be agreed. Negotiations can start but the finalization of an agreement needs to wait until the purchasing agreement is ready.

Annual purchasing volume and the frequency of the deliveries is needed for defining which inbound model will be targeted to be implemented. Also it is needed to know the some of the components delivered by the supplier are also delivered by their competitors. This is very important information for being able to fully utilize the inbound models and have the same component from different suppliers in same inbound model.

If there are customized parts delivered by the supplier it is important to clarify together with the GPR that what is the customization level of the components. It might be that components are designed only for The Company's purposes, or the components might be available also for other customer but in practice only user is The Company, or then the components can be completely standard and openly sold to anyone needing them. This information is impacting heavily on the liability levels that will be agreed on the contract. The more customized the components are the higher the liability is. Common target for liability and flexibility should be internally with GPR in this phase.

5.4.2. Project milestone 2

All the above mentioned is done before even contacting the supplier. Fist contact with supplier should be kick-off session where the target would be shared. Participants from The Company's behalf should be negotiator, buyer and GPR category manager. This way supplier sees that this is a joint target and also internally all different stake holders are on the same page right from the beginning. In the kick-off meeting standard information package about inbound models should be shared explaining why we are doing this, what are the benefits for both parties. Also it is important to understand how well the supplier already is familiar with such inbound models. If they are operating with advanced inbound models with other customers already, the likelihood of willingness to apply it with The Company as well is higher.

After the kick-off session the template of the contract will be send to supplier. The template needs to be cleaned before sending so that it will include only the targeted inbound model definitions on it. Annex 1 need to be adjusted to meet the requirements and ageing liability and liability wave columns need to be removed. This is due the fact that all the negotiations should start with zero liability and they can be utilized as leverage later on in the negotiations. Neither the liability annex should be sent in this phase.

Then starts the most time consuming part, the negotiations themselves. For this it is very important to agree on continuous flow of follow up meetings and set timelines

and target dates when different parts are expected to be ready. Otherwise the more urgent tasks are setting the negotiations aside and the process lasts and lasts.

5.4.3. Project milestone 3

Third milestone is achieved when the agreement in the negotiations have been found and the documents are ready to be signed. Documents need to be cleaned so that all the comments and changes are written in such model that both parties agree on. After that documents are sent to supplier for signing and when received back also get the signatures from The Company's side according to internal signing policy. One original signed contract will be send to supplier and other one will be kept by The Company. Signed contract need to be scanned and sent to GPR category manager whose responsibility is to upload it to company's electronics agreement database. Original contract itself need to be send to contract archive in The Company's headquarters.

5.4.4. Project milestone 4

After contract is signed, the pilot can start. As this is a change of delivery model it needs be agreed that with which code the new process will be piloted. Annex 1 will be filled accordingly and clear cutoff date need to be agreed when the change of models will happen. Pilot needs to be done in a close cooperation with buyer as he is in charge of the daily deliveries. In pilot it is confirmed the process runs smoothly throughout the whole supply chain and that all the systems are supporting the model as planned.

5.4.5. Project milestone 5

To make sure that everything gets done there is still last milestone that needs to be fulfilled in order to get implementation done. Official hand over needs to be done to buyer to clarify that the responsibility has been moved to them. Terms and conditions agreed on the agreement and on the annex 1 need to be shared into internal database so that they can be easily found for further use. Also listing the key topics of the negotiations e.g. if there was some difficulties which were solved, is recommended to upload in team's internal database in order for other colleagues to be able to learn from the other's cases and maybe get some help for own negotiations. These findings can also be used when starting new negotiations as possible obstacles and how to overcome them.

5.5. Proposals

Using the inbound models has been clearly adding value to The Company's supply chain management. Upsides and downsides of the demand have been better in balance with those components that are in either supplier managed consignment stock or contract warehouse model. Also the suppliers who have been using advanced inbound models, even those ones who in the beginning were really hesitant to even try, are seeing these models truly beneficial. They have only one order entry point for The Company's demand and based on that forecast they can optimize their own supply chain and production in the best possible way.

Suggestion from my side is to further increase the usage of different kind of advanced inbound models and pay extra attention to components that could be delivered through iHubs to contract manufacturers as that capability currently is very limited. That process need to be improved and the sooner that can be done the better.

Area of consideration could be wider use of distributors. Currently The Company is doing everything by themselves in supply chain management. As a lesson learned from the benchmark at the EMS companies The Company could study a possibility to let companies who are specialists in distribution take care of some parts of the supply chain. EMS companies are using such companies in certain areas. Distributor will purchase detailed components on behalf of the EMS company and then sell the needed components to them. Of course there is certain fee that distributor is

adding to the component price but as they are doing the same for many customers they can utilize the economy of scale and get better prices from suppliers so the difference is getting smaller. And EMS company does not need to keep the same amount of work force in their own books as they would need to have if they would be purchasing everything by themselves, so the business case could be positive.

Furthermore could be evaluated that how much actually is needed to do in-house and which parts could be purchased as outsourced service. Recently The Company's manufacturing strategy has been moving to that direction that manufacturing is mostly outsourced to EMS companies. Currently there are only two own factories left and already 80-90% of the manufacturing is outsourced. So if the manufacturing is outsourced why cannot the purchasing be as well, at least partially? Remaining control over the critical components however would be crucial to keep in-house and that can bring a competitive advantage in the future. iHub as a concept has proven to support this type of process very well so my recommendation is to further develop iHub concept but focus more on critical components instead of trying to cover everything.

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