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The Outsourcing VMI Strategy
the Case of Suning Company

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Preface

During my 2 years' study for my master's degree. A number of people made this journey meaningful to me. These include my classmates from all over the world, especially the ones from my homeland Wang Weijia, Cao Suhao, Yinjun, Li An. Teachers in every course as well as the working staff in the Molde university college who gave me support on both life and study.

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I would like to thank my parents. You are the ones make me feel that even if no one thinks me to be good, I am the best in your eyes. You are the biggest insprition for me to do anything, thank you so much for your support.

Finally, I would thank my supervisor Jia Haicheng for his continuous professional guidances and effective suggestions, which make this thesis possible.

Summary

As a new inventory control strategy, Vendor Managed Inventory(VMI), which is an integrated management thought, shows another inventory management mode which really challenges the traditional management, and a lot of theories and practices have proved it to be profitable compared to those which refuse to adopt it.

However, there exists limitations and obstacles in the implementation process of this strategy. Finally, the results are not as good as expected according to the modeling research. But if we outsource the VMI to the third party logistics(3PL). Many problems can be solved.

So, in this thesis. Firstly, I will study deep into the knowledges related to the supply chain, and then make some collections of the 3PL theories as well as the VMI strategy. Of course, reference of examples of excellent abroad companies' experience is necessary.

Secondly, according to the existing disadvantages that show in the Suning company's supply chain. I would do an analysis on the feasibility of this company adopting the VMI strategy. What's more, With the help of the professional 3PL which can ensure a timely and accurate information sharing, the Suning company would have better information connection system with all the suppliers.

At last, using the FAHP method to decide how to choose the 3PL on the basis of the risks that the outsourcing strategy brings. Including building the evaluation index system step by step.

On the whole, this thesis has built a framework for the Suning company in choosing the 3PL integrally and scientifically, it could be useful for Suning or other similar companies in some extent.

Key words: supply chain management, inventory control, VMI, 3PL

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1. introduction

1.1 study background

In the past few years, traditional ordering and logistic functions have become a new wide concept with strategic significances, which it is called now as supply chain management system(SCM)(Keah Choon Tan.2001). SCM is an effective method for the various enterprises to adapt the global competitions, as a new management mode. It integrates and coordinates the resources through the whole chain, and emphasizes the cooperation among the strategic partners in the chain, information integration, quick response to the market as well to make more value for the customers. SCM provides a stage for the enterprises to integrate and manage all kinds of resources all together, so it is a new management mode for all the members in the supply chain.

In a supply chain, if it is the supplier who takes the responsibility of doing replenishment decisions for its customers, then this is a vendor managed inventory program(Simchi-Levi *et al*,2003). VMI came from the last 1990es, many companies adopted this program and implemented successfully, like P&G, CampbellSoup and ect. In China, some transnational corporations such as Fairchild semiconductor company, ST microelectronics company have established VMI relation with the local companies(Yang Lin,2007).However, based on the investigations of the implementing conditions of the companies within China, the result is not optimistic, which exists a lot of problems. including some inherent limitations of VMI, and limitations during the operational process. Because the implementation of the VMI depends on the economic environment, the benefit distribution is not fair among the partners, the level of trust still remains low, many enterprises' information exchange technology or the equipment are not good enough(Shi Xiaodong, Guan Zhiming.2004).

So, in theory, in order to implement the VMI strategy successfully. The companies need to get all kinds of capacities in every field. From the successful cases using the VMI strategy, we can see that those companies are always the well known ones with advanced technology conditions. For instance, Walmart and P&G and ect. So, if some small scaled, disadvanced technology enterprises want to use the VMI strategy, they may have to

redesign and replan the existing management flow, which means, it is not easy to promote the VMI strategy in wider field. To solve this problem, the 3PL emerged, which makes the VMI strategy much more feasible. In a research survey of Phani Kumar and Muthu Kumar(2003): choosing the service from the 3PL can get the following benefit, the operation cost can reduce 62%, the service level can increase 62%, the core business can increase 56%, the number of employees can reduce 50%, the property can reduce 48%. Obviously, the 3PL will be an immutable trend.

In this thesis, I will analyze the problems showing in the Suning company's supply chain, and try my best to find methods to cope with them. I think this could be a nice guide for the enterprises which have already used the VMI strategy or the ones are going to adopt in the future.

1.2 research methodology and approach

Firstly, I will study deep into the knowledges related to the supply chain, and then make some collections of the 3PL theories as well as the VMI strategy. Of course, reference of examples of excellent abroad companies' experience is necessary.

Secondly, according to the existing disadvantages that show in the Suning company's supply chain. I would do an analysis on the feasibility of this company adopting the VMI strategy. What's more, With the help of the professional 3PL which can ensure a timely and accurate information sharing, the Suning company would have better information connection system with all the suppliers.

At last, using the FAHP method to decide how to choose the 3PL on the basis of the risks that the outsourcing strategy brings. Including building the evaluation index system step by step.

On the whole, this thesis has built a framework for the Suning company in choosing the 3PL integrally and scientifically, it could be useful for Suning or other similar companies in some extent.

Further more, in this thesis, I will take qualitative analysis as well as quantitative analysis. During the research, I will collect the Suning company's necessary previous operational data as the foundation of my qualitative analysis, and then with the use of the charts, formulas, mathematical models, and flow charts, I can clearly perform the problems, and find the relations inside them.

2. related theories and introduction of some applications

2.1 supply chain management

2.1.1 concept of supply chain

The conception of the supply chain firstly appeared in the 1980es, and with the development of the global manufacturing as well as the information management, it has been widely considered and implemented which also has become a new management mode(Wang Dong, 2007. China Logistics Concl). In the beginning, people consider the supply chain as an internal process, which requires the operations inside the enterprises, at the same time, aims at making a maximum profit for the enterprises itself. However, time marches on with tremendous company business expansion. The enterprises nowadays concentrate more on the core business and the whole supply chain(Martin Christopher, Hual Lee,2005). Ram Gameshan and Terry P. Harrison described the supply chain in the book that: A supply chain is a network of facilities and distribution options that performs the function of procurement of material, transformation of these materials into intermediate and finished goods, and distribution of these finished products to customers. Another definition: a supply chain is an integrated function structured chain which concertrates on the core business through taking the control of the information flow, product flow, and the capital flow, starting from the procurement of raw materials, then the production of the intermediate products and final products, finally by the sales network to be sent to the end customers with the combination of suppliers, manufacturers, distributors, and retailers(Ma Shi Hua,2000).

2.1.2 concept of supply chain management

Supply chain management came from classical logistic problems. With the trend of global economic developing coming into being, enterprise management is not limited to logistic and financing management. The relation of enterprises is materialized to communicate information in broad sense, and achieve cooperation and win-win results. But many contradictions produced, coordination is needed. This brought up a tide of research in academy (Harland, C.M.1996). In today's global market, one of the most significant paradigm shifts of modern business management is that individual firms no longer compete as solely autonomous entities, but rather as integral part of supply chain links. In other words, the ultimate success of a firm will depend on its managerial ability to integrate and coordinate the intricate network of business relationships among supply chain members (Drucker, 1998, Lambert&Cooper, 1998). Therefore, many scholars viewed supply chain as an integrated system, which synchronizes a series of inter-related business processes (Alderson, 1950).

Supply chain management is a set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed at the right quantities, to the right locations, and at the right time, in order to minimize systemwide costs while satisfying service level requirements (Simchi Levi, et al 2000). According to the above descriptions, the supply chain's main objective is to enhance the operational efficiency, profitability and competitive position of a firm and its supply chain partners. Supply chain is a network, the most important part is the core enterprise, the clients are the customers who buy the products or the services. It has 5 main indexes: speed, flexibility, quality, cost and the service (Shen Hui, 2007).

2.1.3 goals of supply chain management

One goal of the supply chain is to maximize the total profit of the whole chain. Our judgement on a supply chain to be successful or not depends on the supply chain's profits to be positive or negative. For any supply chain, the only income is from the end customers, in other words, only the end customers bring the real cash flow. Other cash flows in the supply chain are just considered as the form of the transfer of funds, which should be included as a part of the cost factor. In addition, all the information flow,

product flow, and the capital flow make up the supply chain cost. So, it becomes the key factor that if we can have good management of the above flows(Harland.C,1997).

The other goal of the supply chain is to upgrade its competitive advantage. As Michael E. Porter put in his book competitive advantages(1985): there are 3 ways for the enterprises to get competitive advantages. One way is the low cost, which comes directly from the low cost product and service. One way is the different from the others, which means your products have unique impression for the customers. One way is the target concentration, relating to let the enterprises to focus on one kind or one group market and design specifically for it. Because the enterprises have limited resources, and they can't be better than their competitors. So, concentrating on the core business is crucial.

The supply chain management emphasizes that the enterprises can concentrate on their core competency, and spare no effort to enhance it. At the same time, building strategic cooperators(Dong Qianli,2006). The enterprises do the core business themselves, and let the cooperators to do the non-core business, which means to outsource. By coping with business in this way, the enterprises can gain more advantages compared to do all the business on their own. So, as proved already, an integrated management will add the supply chain's overall advantages to get more competency, which finally will make all the members in the supply chain profitable.

2.2 third party logistics(3PL) theory

2.2.1 concept of 3PL

The 3PL as a new conception was firstly proposed in England in the 1980es, and then was taken to the USA to get forward development in 1990es. The US Council of Supply Chain Management Professionals(CSCMP) put it as: the third party logistics is a firm which provides multiple logistics services for use by customers, the services are integrated, or bundled together by the firm. The services the 3PL provide are transportation, warehousing, cross-docking, inventory control management, packaging, and freight forwarding as well. On the basis of the modern electronics and information technology, the

3PL takes the responsibility of providing the personalized and serialized services at the right time and proper price. In essence, what they are doing is to coordinate the logistics activities from the upstream through the supply chain with the professional working, which results in higher leveled service but lowered cost. Because of what wonderful results the 3PL have brought. They have taken up larger and larger market proportion and develop rapidly(Zhang Meiyang, Gao Yuanyang,2007).

2.2.2 driving forces of 3PL

With the development for more than 20 years. The 3PL have developed into a industry with certain scale. The followings are the driving forces of the amazing development:

Force 1: the inevitable development of the modern logistics management concept(Alan Rushtonand, Steve Walker,2007).

In the 1990es, with modern logistics came into a supply chain management phase, which forces the enterprises in the global market to take priority on the core business to play all their strengths, in the mean time, build wide strategic coordinations with other proper enterprises to make outsourcing plans come true. In the standpoint of the scarcity economics, no matter how broad-scale the enterprises are, they surely have some kinds of limited resources in logistics, which make the enterprises to decide to outsource some logistics work to the 3PL to deal with. So, in today's global market, logistics outsourcing has become a popular trends, and more and more enterprises prefer to join this trend, on the other hand, means big chances for developing as well as a lot of challenges come up for the 3PL companies.

Force 2: the inevitable progress of the technical quality the 3PL are making(Chae Anand, Hansjorg Fromm,2005).

As discussed before, in today's global market, the demands for the 3PL services are becoming more and more which accelerate the development of the 3PL companies. By the wide applications of the total quality management(TQM), just in time(JIT) inventory strategy, zero defect concept, zero fault concept, the logistics industry got new vitalities. What's more, high speed development of the information technology also enhanced the

industry, like the use of the EDI, GPS and so on. All these technologies ensure the logistics work to be quick, reliable, and satisfying.

2.2.3 advantages and disadvantages of 3PL

The obvious advantages of the 3PL

Advantage 1: risk pooling

By outsourcing, enterprises can distribute the risks generated by the government, the economy, the market, the finance factors. In this way, enterprises can be more flexible, and adjust to the new environment more quickly(D.S.Levi,P.Kaminsky,E.Simchi Levi,2003).

Advantage 2: focus on the core business, make use of more resources

limited on-hand resources forbid the enterprises to be professional in every aspect. Since, with the help of the 3PL companies, the enterprises can concentrate on the core business(Yang Luming, Quan Lijuan,2003).

Advantage 3: enjoy more professional logistics services with low cost

Generally, compared with the enterprises, the 3PL companies have more effective and cheaper knowledge and technology on logistics management so as to achieve economies of scale. Besides, they are willing to change or update the technology and the corresponding equipment, which is not that actual for the enterprises(Yang Luming, Quan Lijuan,2003).

In summary, It's common that different retailers may have different and mutative delivery requirements, or information exchange disupt, which demenstrate that the uncertain factors for the customers are too many. However, the 3PL companies can solve these in quick response at low cost instead for the enterprises. In addition, the 3PL company can also meet the demands from the potential customers which can be turned to be the enterprises' customers. If an enterprise build its own logistics team, large ammount of cash should be put into buying the related equipment, constructing the warehouses, and buying required information network facilities. This kind of investment can be a very heavy burden for the enterprises, especially the small and meduim scaled enterprises. If the enterprises turn to

get the help from the 3PL firms, they can not only reduce the investment, but also can accelerate the cash turnover rate.

Despite the advantages the 3PL holds, it also can have problems:

The enterprises outsource the logistics work to the 3PL mostly because they don't have high efficiency if they do it themselves. However, sometimes, this "let go" method can't solve the problem completely, on the contrary, make the outside circumstance even more difficult to be under control. For the enterprises can't directly handle the logistics functions, which implies that they can't make sure that the goods are delivered correctly, then lead to the low service level, finally, lose customers(Zhang Zuoen,2003). For example, during the working process of the 3PL companies, the workers and the vehicles are put on the 3PL company's logo to impress the customers, they are the ones that the customers face directly.

However, if some enterprises too much emphasize on the short-term benefits, choice of the 3PL companies only depends on the low pricing bid. Then the service quality of the coordinator can't be expected.

2.3 vendor managed inventory system

2.3.1 causes of the VMI-bullwhip effect

The Bullwhip effect is a phenomenon that the variation of demand increases up the supply chain from customers to suppliers. The further away a firm from the end customer(in the term of lead time), the larger is this variation.This effect leads to inefficiencies in supply chains, because it increases the cost of logistics reduces its competitive ability(Nienhaus et al,2003). Moreover. Because of the lacking visibility of true end user or consumer demand, an amplification of the predicted demand is created(Ireland, Ronald, K.2004). In the traditional ways of managing the inventory, every partner manages its own inventory, and information exchange among them is little. So for that kind of supply chain, bullwhip effect is inherent in the system.

The causes for the bullwhip effect are various, the followings are the main.

Cause 1: Demand forecast(Martina Kuncova,2007).

It is not assumed that the retailer knows the exact form of the customer demand process. Instead, he uses historical data and some forecasting techniques to estimate the demand, the supplier doesn't know the retailer's data and so he supposes the retailer's order to the real demand. Due to this, the forecast could be very different and that's why the orders can vary.

Cause 2: Order batching(Martina Kuncova,2007).

Usually, the pricing policy is the main reason for ordering in batches, and because of this, the next player in the supply chain has to have higher inventory to avoid the depletion of the inventory.

Cause 3: price fluctuation(Martina Kuncova,2007).

If there are offers on price discounts or quantity discounts, the customers will spend a lot to buy in large quantities. Suppose their behaviour is rational, they buy more when the price is down, buy less when the price is high. However, it doesn't reflect their true needs. So, this may lead to bullwhip effect.

Cause 4: Rationing and shortage gaming(Martina Kuncova,2007).

This somewhat likes the price fluctuation. It happens when demand is higher than supply or when the consumers predict it may happen, then they begin to exaggerate their real needs to be sure that the existing demand will be satisfied, the demand amplification effect will grow up even further if customers are allowed to cancel their orders when their real demand is fulfilled.

Cause 5: The information distortion(Martina Kuncova,2007).

Retailors always face the end users directly, so they know the real information about the demand, prices, discounts, the inventory and so on. However, in traditional ways, they would not be happy to share these information with the upstream players, which leads to the unknown market state for the upstream players. Without the accurate data, it will be very hard for the enterprises to make precise forecasting.

Cause 6: Lead time (Simchi-levi,Kaminsky,2000).

When the amount of customers' demand falls, the suppliers need to empty its inventory to avoid high capital costs on keeping them. On the contrary, when it increases, the inventory needs to be filled to avoid backorders. In fact, in a common sense, when a production process lasts for long time to finish or the lead time for the goods delivery is

long, then the manufactures usually want to produce more in case big demand comes and there is not much inventory in the warehouse. Reversely, if the lead time is short, the manufactures can change the production plans flexibly.

Cause 7: delay times for material and information flow(Graham,Gary,2005).

delay is the time of time on steps, which have to be followed so as to do some work. Because of the delay, each player in the supply chain has to set up a safeguard for their work. When demand is forecasted, the long-term demand has a larger variance than the short-term demand forecast and consequently needs a larger inventory as a safeguard.

Cause 8: independent forecast(Graham, Gary,2005).

Independent forecasting is the case that each partner in the supply chain places its own order after professional forecasting independently. By collecting the relevant customers' demand downstream. And this independent forecasting enlarges the chance to be exposed with the information.

On the whole, we can know that, consequences of the bullwhip effect in a supply chain include wasted money, wasted materials, wasted labors. How to eliminate the bullwhip effect has become the research topic for many experts. And, R, Michael Donovan(2006) put that: provide vendor managed inventory(VMI) services by collaboratively planning system can effectively eliminate the bullwhip effect.

2.3.2 vendor managed inventory concept

Vendor managed inventory(VMI) was firstly proposed in the early 1980es with mass retailers demanding suppliers to take the responsibility of inventory replenishments based on the sales information data by the retailers(Cachon, Fisher,1997). Nowadays, VMI strategy has been spread out in various kinds of enterprises. VMI is a coordination strategy which means under the condition of minimizing the total costs, suppliers and retailers make an agreement to let the suppliers take control of the inventory, and continuously monitor, modify the execution of the agreement to make good management of the supply chain inventory(Zhou Xiaolong,2006). Since the concept of the VMI had been put out, scholars started to study about this strategy, and a number of modeling and simulation research has proved VMI as an effective method of cutting down total supply chain costs and increasing the availability of the materials or finished goods, and it's also a useful

strategy to eliminate the bullwhip effect(Yao ,Dresner,2008). What’s more, theoretical and conceptual papers on VMI based on case study have also give strong proof to the good benefit of implementing the VMI strategy(Jouni Kauremaa,*et al* 2009). To be specific, the spirit of the VMI is that the enterprises in the downstream in a supply chain give up the control rights of keeping inventory, instead, the upstream enterprises take control of integrating the inventory trend based on the sales statistics, sales plan, or production plan from the downstream companies. The upstream enterprises place orders and make replenishments to realize quick response to the ever changing customers’ demands. and the same time, reduce the inventory holding cost(Kuk,G,2004). To make the VMI concept more visible, the following figure 2-1 presents:

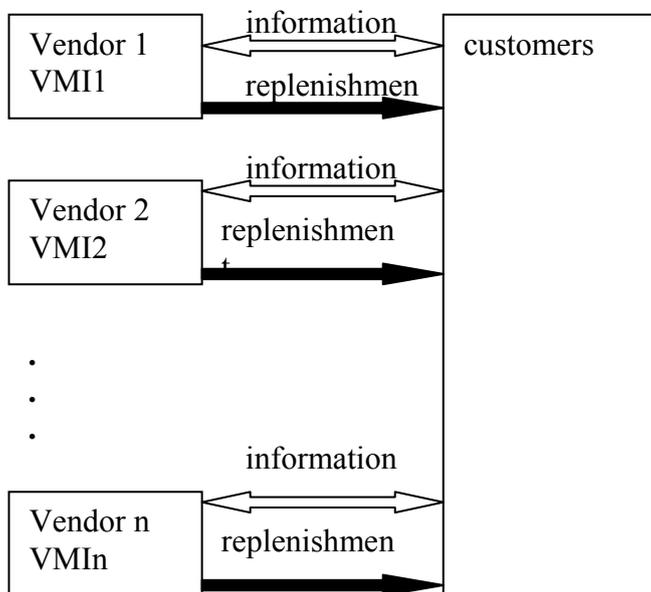


Figure 2-1 The process of the VMI

2.3.3 a case study of successful implementation of VMI

The successful cooperation between the Nestle company and the Carrefour company on implementation of VMI (Wang Huailin et al,2005).

Nestle company is the world’s biggest food company, was founded by Henri Nestle in 1867 in Vevey, Switzerland. With more than 100 years of development by expanding, merging, investing, it has established its leading role in the food industry, employing nearly 225,000 workers in 479 factories in 81 countries over the world. Carrefour is a

French supermarket which was established in 1959, with tens of years' development, it has become one of the largest supermarket chains in the world. Encompasses 9100 units of retailers all over the 32 countries. Nestle company of Taiwan implemented the VMI strategy with the Carrefour since October, 1999.

The whole plan for the two companies is to build an operation environment for the VMI in one year. Basically, there are two stages, one is the system building of the cooperation model, the other is the implementations and improvements of the system. In the first half year of the first stage, the relevant jobs including the confirmation of the resources that two companies invest, formation of the evaluation system or the score card, analysis and negotiations of the qualifications the system needs, as well as the establishment of the operation mode. The second stage took up the rest of the half year, keep modifying the conditions of the system to improve the operation process in order to get a stable system. Both of the two companies set up a work team to communicate frequently. As for the capital invested, the Carrefour side mainly put in the establishment of the EDI system, and the Nestle not only established the EDI system, but also the VMI system.

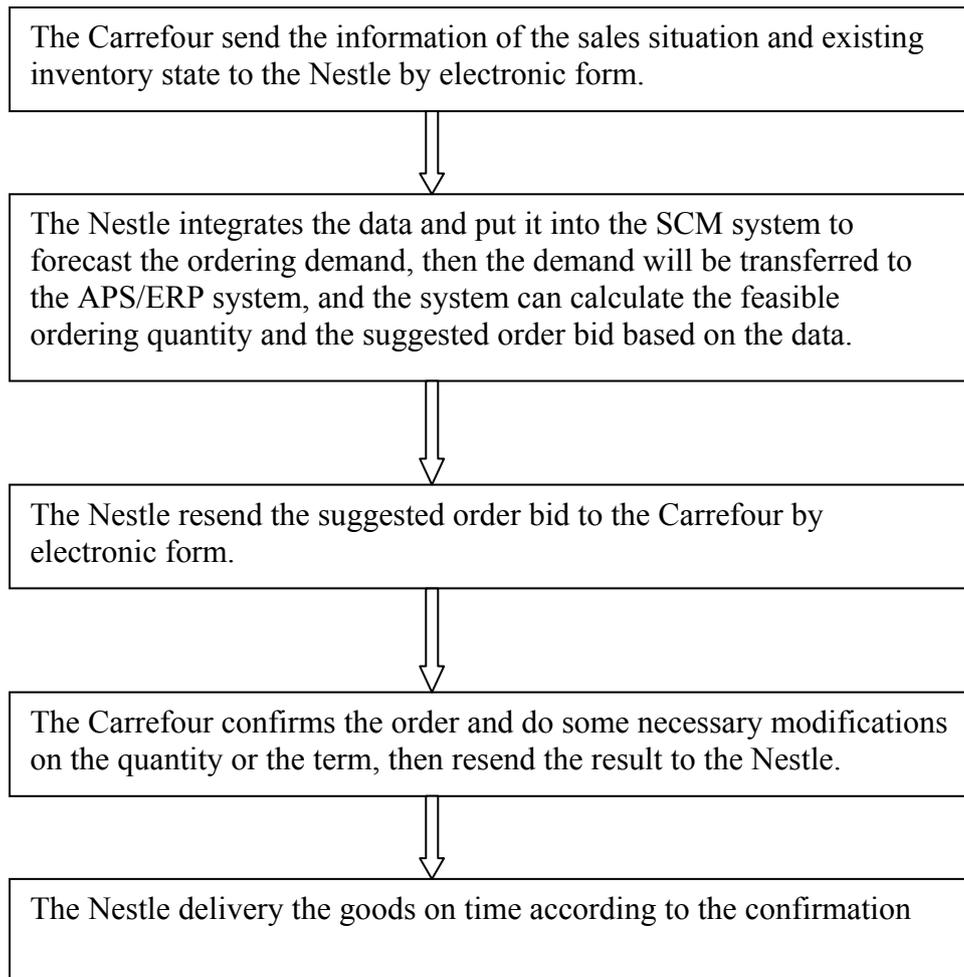


Figure 2-2 The ordering process of the Carrefour

After the implementation of the VMI, the arrival rate of the goods from the Nestle to the Carrefour increased from 80% to 95%, the arrival rate of the goods from the distribution center of the Carrefour to its retailers' shops increased from 70% to 90%, the good results keeps increasing. In addition, the average number of days the goods kept in the warehouses as stock reduced from 25 to the objective number that planned, the rate of the modifications for the order reduced from around 70% to 10%. Besides all of these specific achievements, in the mean time, through this cooperation, the two companies got closer understanding with each other and became willing to deal with the problems together, this kind of cooperation makes the two company realize their weaknesses and try hard to improve the supply chain's efficiency. Based on the successful results of the implementation of the VMI strategy between the two companies. The Nestle company considers that they can also implement the VMI strategy into other channels.

2.3.4 rules in the VMI implementation process

As far as we know, the successful implementations of the VMI strategy can reduce the inventory of the enterprises, increase the speed of the goods delivery and have quick response of the market, which will lead to the further development of the whole supply chain(Vigtil,A,2007). Make an induction, the key rules are:

Rule1:Realization of the cooperation

During the implementing process, the trust between each other and the absolute information exchange are very important(Tang Shenghai *et al*,2004). Under the condition of keeping good relationship of coordination between the suppliers and the Suning company, the Suning company can make good operations.

Rule2:Reciprocal rules

In fact, the implementation of the VMI strategy is not a problem of how to distribute the costs, or who should be the payer. But a problem of how to work together to reduce the total costs for every player in the supply chain(Tang Shenghai *et al*,2004).

Rule3:Goal congruence

Both of the player should clearly understand their respective responsibility, the first step is to have a common goal. For example, where to put the inventory, when to pay the cost, whether to pay the management fee how much to pay. And all of these questions should be answered in the frame protocol(Tang Shenghai *et al*,2004).

Rule4:Continued improvement

Both the supplier and the retailer share the profit and eliminate the waste. The spirit of the VMI is that under the permission of the Suning company, the suppliers build up the warehouses, determine the inventory level and the replenishment strategy to control the inventory.

2.3.5 steps to implement the VMI

The followings are the steps that the VMI are implemented:

Step1:the establishment of the information system of the customers(Huang Dongmei *et al*,2005).

In order to effectively manage the sales inventory, the suppliers have to grip the customers' related information. Through the establishment of the information database of the cutomers, the suppliers can grasp the changing situation of the customers' demand to make forecast and analysis to be integrated into the system.

Step2:the establishment of the network of the sales management system(Huang Dongmei *et al*,2005).

Good management of the suppliers' inventory comes from the complete network of sales management for the purpose of smooth logistics of the information and the goods. So, the suppliers have to: firstly, Guarantee the readable and the uniqueness of the codes for their own goods. Secondly. Solve the problem of standardization of the sorting and the coding for the goods. Thirdly. Solve the problem of identification of the goods during the transportation. Nowadays, with the integration of the sales management function within the software like MRP II or ERP, suppliers can have complete network of sales management system.

Step3:the establishment of the cooperation framework protocol between the suppliers and the distributors(Huang Dongmei *et al*,2005).

Through the negotiations between the suppliers and the distributors, they can determine the relevant parameters like reorder points, the lowest inventory level and so on, and they can determine the transfer mode of the inventory information, for instance, EDI or Internet.

Step4: the change of the organization(Huang Dongmei *et al*,2005).

Because the introduction of the VMI stategy, the suppliers have to make some change of the mode of the organization. Before, the accountant and the manager cope with the customers' bussiness. But now, a new department which is responsible for controlling the customers' inventory and the service level should be added.

The transparency of the inventory state is the key of the VMI. The suppliers can keep following and checking the inventory status all the time, so as to make quick response to the change of the market's demand, then do adjustment to the production plan.

2.3.6 benefits of implementing the VMI

A lot of companies are implementing the VMI, and by doing this way, both of the suppliers and the retailers can benefit from it.

For the suppliers, they can not only simplify the forecasting work, but also modify the operation strategy in a quick response, given that they can get the market data easily. In addition, effective forecast can let the suppliers make good arrangement for the production to eliminate the waste. In the beginning of implementing VMI, the inventory cost for the retailers can be reduced, so the retailers decrease the unit price to enlarge the market. In return, the order quantity from the retailers becomes larger. When the order quantity goes up to a certain level, the suppliers will get more profit due to the economies of scale. At first, the attitude of the suppliers may be not happy, or even suspicious. However, as time goes on, the suppliers come to realize that the VMI strategy also make them benefit a lot(Lau H, Lau A H-L.1994).

For the downstream enterprises in the supply chain, the implementation of the VMI strategy can return more benefits(Pohlen,T.Goldsby,T.J,2003). Because they pass the planning and ordering work to the suppliers. The goods are more available, the number of backorders is less, the inventory holding cost is cut down largely. So they can concentrate on their core business to get more competitive advantages in the market.

For both upstream and downstream enterprises, by information exchange through internet, the number of errors in the data will be reduced. What's more, VMI can delete some unnecessary links to simplify the purchasing links. In this way, the whole life cycle and the capital input for purchasing can be reduced. Since, by implementing the VMI, both the demand and supply sides can benefit a lot. As a new inventory management strategy, it challenges the traditional way of holding inventory, but actually adjusts the modern market, which reflects the spirit of integration (Burke,M.,1996). Further more, the manufacturers, the retailers and the distributors get together to focus on one common goal: how to coordinate effectively to sell more goods to the end customers.

2.3.7 problems in the implementation process

By implementing the VMI, enterprises can benefit a lot. However, if the operations are inappropriate, troubles will appear. Nowadays, many companies have adopted the VMI strategy in China, but some problems during the operation process block the widely development of the strategy.

2.3.7.1 analysis of the VMI model

Quite a number of models have been set up to simulate the supply chain using VMI, for example, Cachon and Fisher(1997) simulated the impact of the VMI based on the Campbell Soup, they came to a conclusion that the retailers get benefits by the reduced inventory cost with the same service level. Archabal *et al*(2000) made a model based on one supplier and more than 30 retailers, and found that the VMI strategy could lead to not only the increased inventory turns, but also decreased lost sales at the retailers.

Raghunathan and Yeh(2001) built a model for one supplier and n retailers to find that VMI reduces the inventory holding cost for both the suppliers and the retailers, and they also proved that if the suppliers which adopt the VMI strategy manufacture the mature products with stable and large demand, they can get more profit compared to not use the VMI.

Dong and Xu(2002) assumed that there was one supplier and one retailer in the system using the VMI, the simulation outcome told us that the VMI strategy always leads to higher retailer profits, however, it is more likely that the suppliers get more profits in the long term than in the short term, and for the whole, the inventory holding cost is reduced always.

For Disney and Towill's model(2003), they clearly noted that the VMI strategy is a good method to eliminate the bullwhip effect. The Campbell Soup company and the Johnson & Johnson company in America, the Barilla company in the Europe have already taken the VMI strategy. So do some Chinese companies in nowadays(Jiang Zhenying *et al*,2003).

From the successful cases adopting the VMI, some limitations still exist. Firstly, the products should not be alternative. The retailers sometimes sell the products from the different competitive suppliers, and if the products can be alternative choices for the customers, then the VMI strategy has drawbacks(Kim, H.S,2008). Because each supplier always ignores the influences the alternative product brings in, which results in higher

forecast for the inventory. Secondly, the unbalanced benefit between the suppliers and the retailers makes us hard to imagine that, the suppliers are willing to keep the inventory for those not so important clients, or the powerful retailers sign the VMI contract with the suppliers without competitiveness(Kim, H.S,2008).

2.3.7.2 current complementation of VMI in China

In China, VMI is quite a new management spirit. It is an improvement for the information flow in the supply chain, which means a big challenge compared to the traditional management thoughts. However, most of the Chinese experts are concentrating on the introduction of the frontier theory, lacking of the introduction of the specific practices of the system operation, which lead to the insufficient understanding of the domestic enterprises, and for the VMI itself, it is an advanced supply chain management spirit which integrates quite many theories. So, it is hard for many enterprises in China to grasp the spirit and implement widely. Due to the excess inventory within the enterprises and the downturn in the business environment, the number of the new orders keeps falling. It seems that the VMI could be a breakthrough means for the enterprises to be beneficial. However, from the current situation, there exists some problems to block the implementation of the strategy(Zhang Ze, Zhang Haicheng, 2008).

Problem1: The successful implementation depends on the economic environment. When the supply is more than the demand for a product in the market, it is easy for the suppliers to ensure the continued replenishment and avoid the stockout, so the customers are dependent on the suppliers. On the contrary, when the supply is less than the demand, the suppliers may feel hard decide how to deal with the situation that some customers are so eager to get the goods, and some customers still have inventory kept in warehouses for a few weeks(Zhang Ze, Zhang Haicheng, 2008).

Problem2: The unbalanced benefit distribution between the partners. Under the VMI mode, the suppliers are responsible for the inventory holding and the demand forecasting. Comparing with the retailers, the suppliers get less profit. This creates the not uniform situation with responsibility and profit, which influences the activity of the suppliers. An investigation showed that the motions of the partners to implement the VMI vary. When

they were asked of the benefits the VMI brought, the retailers said that they would reduce the inventory, speed up the turnover of the capital, increase the availability of the goods by adopting the VMI. However, the suppliers said that they accepted the contract because of the requirement from the retailers. At the same time, the total benefit that the VMI brings is hard to evaluate. The dominant benefit includes the reduction of the inventory, the reduction of the logistics cost, the possibility of implementation of the Just-in-time management. But the VMI also has recessive benefit, like the elimination of the various waste, the decrease of the capital cost, the exposure and the solution of the problems in the management. In addition, the benefit of the VMI always appears after the run of long time, and sometimes, some trade secrets are within. In summary, the total benefit is hard to evaluate(Zhang Ze, Zhang Haicheng, 2008).

Problem3: The biggest challenge-trust. In order to get the sales data, both the suppliers and the retailers can get into the each other's MPR II or ERP system which may be related to the trade secrets. However, to run the VMI effectively, the degree of the trust between the partners should be increased. Otherwise, it is impossible for the common share of the information and the integration of the cooperation(Zhang Ze, Zhang Haicheng, 2008).

Problem4: The high level technology requirements. The integrated IT system is the communication bridge of the key element for implementing the VMI. For the information is controlled and managed by the technology equipment. So, during the implementation process, the partners keeps exploring the standard, scalable toolkit to have automatic management on the ordering, inventory and forecasting process. To ensure the excellent supply chain information management, the enterprises should have the solid foundation of the capital, the relevant research and development of the technology as well as the effective logistics management. But, not all the enterprises have such capacities(Zhang Ze, Zhang Haicheng, 2008).

Indeed, the successful implementation of the VMI has high requirements on the quality of the enterprises. Based on the analysis, most successful companies which adopt the VMI strategy actually have required characteristics. However, most of the companies at resent don't have such features or advantages. So, there are many limitations and blocks ahead of the widely implementation of the VMI. If the companies don't understand the VMI thoroughly, don't see the environment clearly, they may not have the good effect. With the

help of the third party logistics to implement the VMI, many problems can be solved, which can enhance the feasibility of the VMI.

3. Suning Appliance Company and its logistics

3.1 introduction of Suning Appliance Company

Suning Appliance company was founded in 1990 in Nanjin, China. And now, it is the leading company in the industry of 3C(consumer appliances, computers, communication products) home appliance retail chain in China, which is one of the top 15 conglomerates emphatically supported by the Ministry of Commerce. Up to 2010, the Suning Appliance company has run over 1500 chain stores covering more than 300 cities in 30 provinces and municipalities all over China's mainland, Hong Kong and also Japan, with at least 150,000 employees with its annual sales volume of more than 120 billion RMB. Boasting its brand value of 50.831 billion RMB. The Suning Appliance company retains ahead of the Chinese commercial chain industry, and ranks the top 3 domestic private companies and No.54 among the Top 500 Chinese companies, further to be elected into the Forbes top 50 Asian Enterprises and No.1 Chinese retail company among Forbes Global Top 2000 Enterprises. Currently, the Suning Appliance company offers 8 major categories including air-conditioners, refrigerators, washing machines, color TVs, Audio-video products, small home appliances, communication products, computers, and digital products covering more than 200,000 specifications of nearly 1,000 brands(see Figure 3-1 below).

Table 3-1 the main appliances' trade of Suning company in 2010 (YUAN)

Items	revenue(thousands)	profit(thousands)	proportion
TV,video,DVD	19713007	3762354	26.56%
fridge,washing machine	12937736	2736622	17.43%
digital,IT product	12364458	903961	16.66%
small appliances	9698574	1766329	13.07%
air conditioners	9528368	1981943	12.84%
communication	8898849	891702	11.99%

products			
installation and maintenance	854589	268155	1.15%
other products	231876	574	0.31%
sum up	74227457	12311640	100.00%

From the numbers in the figure 3-1, we can see that the home appliances sold in 2010 in largest amount were the TV, video, DVD. And the other appliances were sold in almost equal amount. The most important meaning we can know from the figure is that the huge amount of revenues and profits that Suning made.

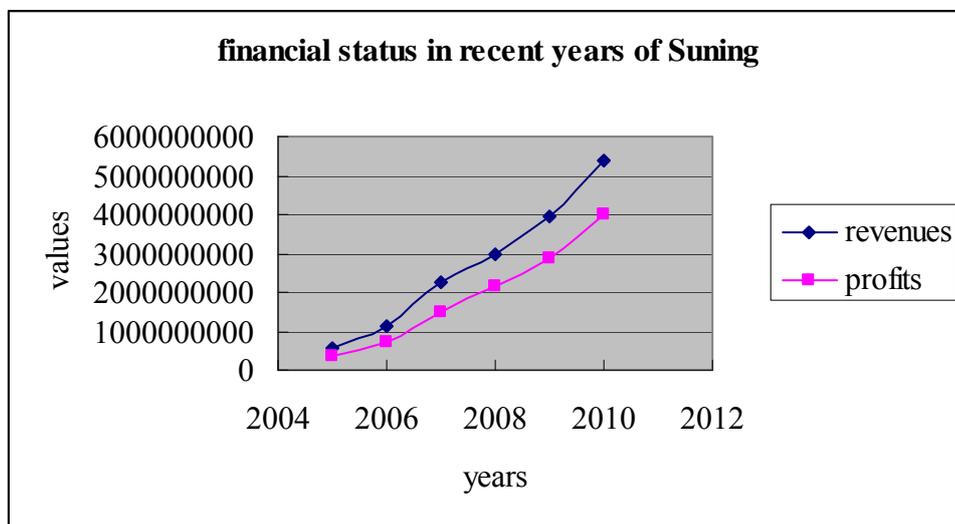


Figure 3-2 the financial status of the Suning company in recent years (YUAN)

Figure 3-2 tells us that in the past few years, both the revenues and the profits of the Suning company had turned out to be increasing. And according to the increasing trend, in the future, the Suning company will develop better and better.

3.2 analysis of home appliance industry in China

According to the data from the National Bureau of Statistics of China. The total retail sales of the consumer goods in our country increased every year(see Figure3-3 below), and the growth trend is obvious strengthening, which means the consumers market is very good for the retail enterprises, especially the leading ones, like Suning company.

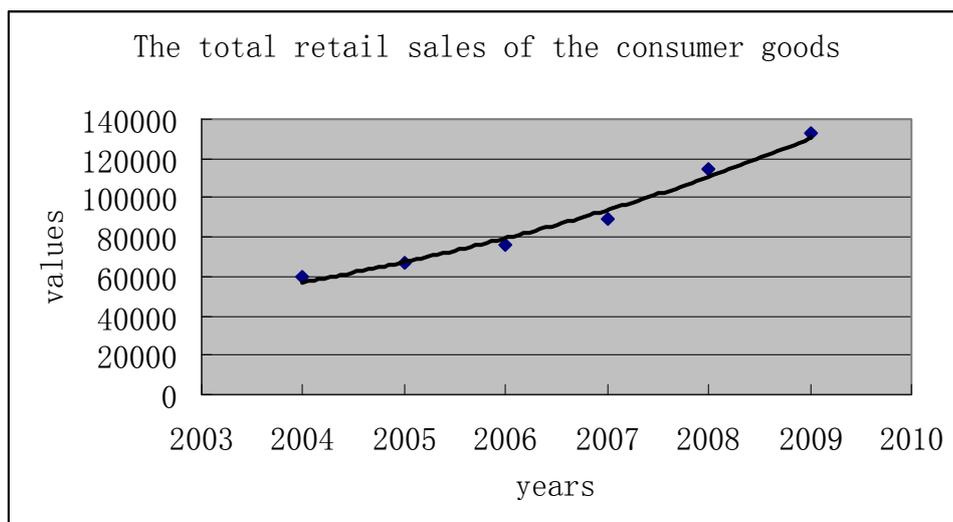


Figure 3-3 Total Retail Sales of Consumer Goods of China in recent years (0.1 billion RMB)

Also according to the data from the National Bureau of Statistics of China. In 2010, the macroeconomic of China was basically good, and the national economy was operated smoothly. With a series of policies of the promotion of the consumption and the expansion of the domestic demand. The consumption market was active all the time. On the whole, the total retail sales of the consumer goods increased with an average rate of 18.4%.

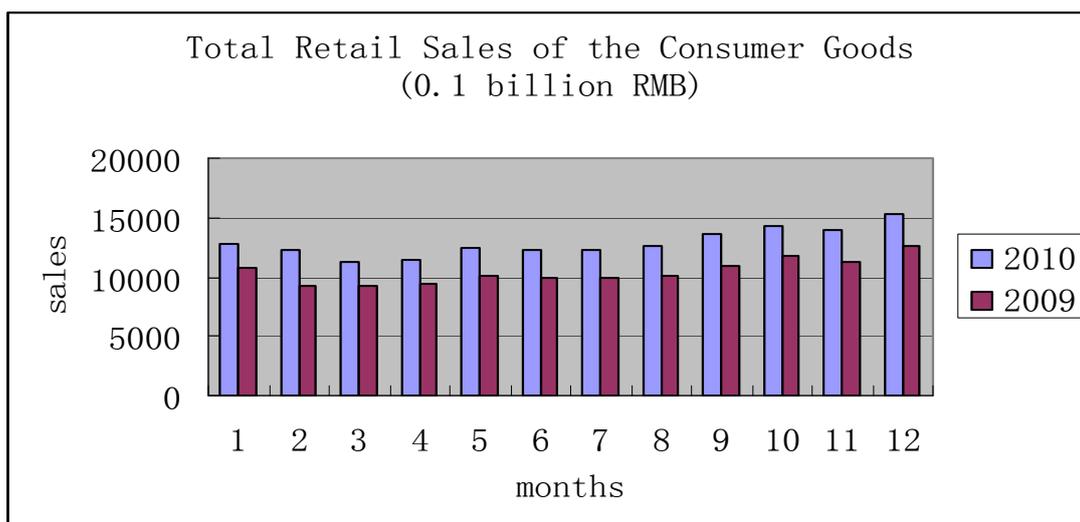


Figure 3-4 Months of Total Retail Sales of the Consumer Goods of China in 2009&2010

In 2010, with the widely implementations of the released public policies including “exchange the old appliances for the new ones”, “send the appliances into the rural areas”

and so on. The consumer market of the home appliances was pushed forward largely. Plus the trend of the rapid update and the replacement of the products. For example, the inverte air conditioner, the flat TV, the 3G and the intelligent mobile phones. As we know, there exists a lot of gaps between the cities and the countrysides in China, and at present, the stores of the home appliances selling are mostly located in cities. So, the potential space of penetration for the appliances companies to the countrysides is still big. In addition, under such intense competition environment. The leading companies in this field could be stronger and stronger due to the structure of the products, the management capacity, and the overall strength, for the small scaled companies, they may merge with others to get the power of anti-risk. What's more, the suppliers and the retailers implement the proper cooperation mode under rational considerations, establishing and improving a long term, strategic cooperation relationship to strengthen the core competitiveness. So, in a comprehensive analysis point of view, the present development opportunities are bigger than the challenges for the appliances industry. The key is how the companies hold on the existing strategies and keep on improving them during the implementation process.

3.3 information system for Suning-SAP&ECR projects

3.3.1 development of SAP project

The Suning company was first started to sell the air conditioners. In 1996, Suning company developed an after service system based on the DOS operating system. The workers put the delivery, installation and the maintenance information data into the system to build up a preliminary customer relationship system and a computerization financial system, which made the Suning company a pioneer in the appliances industry at that time period.

In 2000. Suning company cooperated with Jinli in Wuhan to adopt the ERP system as their information management system, which was an advanced action at that time. However, a lot of core problems were discovered during the management process with the rapid development of the Suning company. The existing ERP system could no longer support the ever growing demand. The vice president of Suning Ren Jun(2006) pointed that there

were 3 problems in the system: the first problem is the purchasing. Before, the company focused on the brand marketing and its suppliers, but now, we have to concentrate on the single product, tracking the sales status on every single product type. This change from the management of the suppliers to the single product, which requires the system to be good at the management, the analysis, and the mining capabilities of the useful data. The second problem is for the customers. Before, we mostly did the analysis on the whole customers' data. But, now, we are on the transition to the individual consumption, the individual service and the individual marketing. By the sale and the implementation of the membership cards to provide the one to one marketing service. All of these have exceeded the capacity of the former system. The third problem is the sequence problem of the supply chain and the service chain. We always wonder what to do and when to do, like when the customers want us to deliver, install, maintain, or when the goods will be on site from the suppliers. These things not only depend on our ordering status for the suppliers, but also need us to connect all the links together. We used to make a promise to deliver the ordered product on time, and then found that there was no inventory for that kind of product, which led to the delay of the delivery. This means that we need a stable, safe and scalable system. So, the former ERP provided by the Jinli company should be replaced, because it mostly performs as a workflow software. However, the Suning company wants to improve the business capacity during the working process, including both the organizational structure of the system and the set of the job responsibilities. The Suning company becomes more and more desirous for a software that can combine the business and the financial goals together to control the operation of the whole company.

After half a year's comparison, the Suning company finally choosed to build up the SAP system to manage the information. Due to the large sccale and the complexity of the project, and the big ammount of money invested. The Suning was careful on every step. The completed system was not promoted comprehensively, but tested in few stores to make sure that the system can be implemented steadily. In the next months, they continued to test the new system into every detail to check whether it can adapt the business flow of the whole company. For instance, the SAP system requires very exhaustive input data and the content to be filled, so the process is a little complicated. However, they cann't let the customers to wait for long time for the treatment. So the simplified process for the front desk was required. Then, the creation of the simple interface front desk POS system solved the problem. By the april in 2006. The Suning company had transformed all the stores into

the SAP system, the ERP of the system had already implemented. Given that the scattered data all over the country was hard to collect, the Suning company integrated all the 24000 computers in 300 stores in China together into the engine room in Nanjing, which made the financial system and the business system joint better.

3.3.2 development of ECR project

Efficient Consumer Response(ECR) is a modern supply chain management mode, which aims at reducing and eliminating the cost during the manufacturing and distributing processes in the supply chain, to bring the biggest profit for the customers based on the close cooperations among the manufacturers, suppliers, and the retailers. The goal of the ECR is to build up a customers based system which have quick response capacity to make the players in the chain as partners. The goal is to improve the efficiency of the whole chain to make the end customers satisfied, not to focus on the every one link, which will lead to the decrease of the cost on the operation, the inventory holding, the increase of the service level. The implementations of the ECR include the effective space management, effective replenishment, effective promotion, effective introduction of new products. The results that ECR will lead to are: providing the high level service by low level cost, change the relationship from the traditional “lose or win” mode to the “win and win” mode, create the largest marginal value by getting the effective market, the manufacturing, the logistics decision using the timely information support, ensure the availabilities of the goods that the customers want.

3.3.3 cooperation with Haier company using SAP&ECR systems

With the development of the concept and the technology. The large capital invested information platform plays a more and more important role in the integration process of the supply chain. Since the Suning company implemented the B2B with the main home appliance suppliers in 2005, it started to implement the new ECR cooperation mode with its biggest sales brand-Haier. Founded in 1984, the Haier Group is a Chinese home appliance brand which has grown into an international enterprise with over 70,000

employees all over the world and gets a turnover of 135.7 billion RMB in 2010, which make Haier the NO.1 brand of consumer appliances.

The cooperation between Haier and Suning started in the early 1993. for the information docking aspect, Suning has experienced four stages, they are the after-service information system, the business and financial information system, the ERP system, the SAP system. So, the development of the information system of Suning has been mature. The B2B project was a big important project which was supported by the technology branch of the Chinese government in 2006. the SAP/ERP system was called the “beacon project” in the retail field by the SAP company in Germany. From the conditions for the implementation of the ECR. The common service concept makes the 2 company keep the same value concept, the huge amount of business cases create a big space for the both sides to integrate the supply chain to make better service and get more profit. In summary , comprehensive factors make the 2 company cooperate to build the required systems to create conditions for implementing the ECR, and find ways for the transformations of the information advanced marketing.

The ECR contract between Haier and Suning realizes the flows of the information and the capital by “customers-orders, orders-goods, goods-cash”. The specific process is like this: based on the digital information platform, Suning passes the customers’ demands to Haier as soon as they receive, the R&D department of Haier invent the new product according to the customers’ requirements as soon as they receive the information from Suning, then deliver the products to the Suning to satisfy the customers. The cooperation brings many revolutionary innovations, and increases the competitivenesses for both the 2 companies. For example:

1. The successful docking of the information between Haier and Suning makes the knowledge management and the database marketing as the basic way of working. Realizing the share of the information, the synchronization of the cooperation, the synchronization of the work. At the same time, the 2 companies can strengthen the contract management, the procurement management, and the management of returns of goods. Realize the standard procurement and the convenient payment through the internet to make the transparent exchange of the information, which lead to the simplified working process under the condition of trust.

2. Make the analysis of the market together. Through the big amount, in time, and precise data of the customers from the Suning, Haier can produce the proper products to satisfy the market. This changes the former situation which Haier had to plan to evaluate the production passively.

3. Reduced the inventory holding of the Suning company, which speeds up the turnover rate of the goods. At the same time, accelerate the turnover rate of the goods as well as the turnover of the cash. This behavior obviously saves the transaction costs and make the customers get the preferential prices of the products.

4. Shorten the production time cycle and the transaction time of the products. It's reported that before 2006, the time for the production of one kind of product to its appearance and widely spread on the market is about 3 months. However, after the implementation of the ECR, the time reduced to 1 month, which makes the circulation of the products more effectively. And more importantly. The Suning company can get more startings rights of the new products.

3.4 current status of Suning's logistics

The distribution centers of the Suning company were transformed by the old typical warehouses. There was no shelf in the DC. The stacking style for the inventory was just tiled. There were only few forklifts in the operation site, most of the goods were moved artificially. The distribution of the goods of the Suning company was an integrated way with both the third party logistics companies and the its own vehicles. From the point of the information, the Suning company has adopted the SAP/ERP system, which unites the internal information platform focuses on the financial businesses.

The Suning company has set 6 large logistics bases located in Hangzhou, Guangzhou, Nanjing, Shanghai, Beijing, and Sichuan, and all of them are connected through the SAP information system. With the standard of the third generation technology, the present distribution centers are advanced at the efficiency of the in and out storage of the goods, the speed of the handling and the transportation of the goods, the on time and in time delivery of the goods, the response speed, the satisfaction level of the customers, and the

reduction of the loss rate and the failure rate of the goods. All of these advantages are due to the proper adoption of the modern equipment, and the WMS inventory management system which has an auto management of the input and output products. Despite of these factors, the new distribution centers only concentrate on the single company of the Suning company. Due to the less communications and the cooperations between the Suning company and the suppliers, the Bullwhip effect and the low efficiency of the supply chain are still the problems that need to be solved. So, in order to eliminate the disadvantages in the Suning company's supply chain, they can't only depend on the establishment of the modern distribution centers, the advanced logistics equipment and the inventory management system, but should also rely on the frank cooperation with the every suppliers to realize a minimal total cost and a efficient supply chain based on the systematic and integrated management spirit.

3.5 disadvantages existing in Suning's supply chain

Disadvantage 1. the Bullwhip effect results from the isolated information exchange. Although the Suning company has the advanced SAP/ERP system. But most of the information exchange of the system happens inside of the company which leads to a bad information share system. So, the lack of the information share between the Suning company and the suppliers is an important factor that leads to the bullwhip effect. Compared to the forecast for the customers' demand, the Suning company is more concerned about the increases and the decreases of the material price. So, in most cases, the Suning company makes orders ahead of the increase of the material price, or makes large order quantity influenced by the order quantity discount policy. The behaviors confuse the suppliers whether the demands is high or not.

Disadvantage 2. the lack of the systematic supply chain management concept of the Suning company.

Under the actual processes. The Suning company keeps its own inventory, the suppliers keep their inventory, the material suppliers keep their independent inventory. So, every part of the supply chain keeps its inventory independently. Although this kind of behavior can make the every part's inventory cost minimised at the starting point of the maximised profit for itself. But from the whole point of the supply chain, it's not advisable. Because

it is only the optimization for every link, not for the whole supply chain. Both the suppliers and the Suning company have paid much costs on the inventory, which lead to low profits. The backward construction of the logistics platform becomes a limitation for the Suning company to enlarge the capacity of the integration of the resources, the procurement and its supportings inside the company.

Disadvantage 3. the lack of the cooperations and coordinations between the suppliers and the Suning company

Through an investigation. I heard that, the Suning company sometimes reduces the purchase cost, fights for the high rate rebate, get more rights on the controlling of the prices of the products, limit the profit space for the suppliers by the means of making promises of selling the given products out, buying the sales rights of the brand, purchasing some products in really large scale, and all of these behaviors make the uncoordinated relationship in the supply chain.

The problems stayed in the Suning company's supply chain can't make the total costs to be minimal. What's more, building the logistics base for itself is not a essential tool to solve these problems. So, the chasing for a new inventory management system to change the traditional way of divided management mode is important. Holding a systematic, integrated management spirit in the process of inventory management can make the supply chain management system get the to be operated in one way direction.

4. analysis of VMI strategy for Suning

4.1 priorities for Suning to implement VMI

Priority 1. the cooperations and trust between the suppliers and the Suning company
The Suning company has enough influences and speaking rights when they are facing its potencial suppliers, which means that only if the Suning company is the key client, then the suppliers are willing to keep the added inventories for it. Since the VMI strategy makes the suppliers bear more stress to keep the inventory, on the other hand, the Suning company enjoys the advantages of whenever there's an order, there's available goods, if

there's no order, then no inventory. When the VMI strategy is implemented between the partners, the high cooperation spirit is necessary. The trust between the partners can make the inventory status transparent. Only in this way, the implementation will be effective. Otherwise, even if the both sides have the same interests foundation, the cooperations can't be achievable.

Priority 2. the reasonable distribution of the responsibilities and interests

During the implementations of the VMI strategy, detailed and required rules and regulations must be drafted to clear the responsibilities and the obligations for the suppliers and the Suning company. Without the distribution, there will be no existing basis for the cooperation and the trust for both of them. When they are formulating the rules, they make the arrangements for the payment of the inventory cost, the storage of the raw materials, the management of the distribution centers' operation process, the transportation management, the control and management of the inventory, the forecasting of the demands. In short, whatever the regulations, one basic guideline should be complied. That is: the rule should be good for the reduction of the whole supply chain's cost, the increase of the service level for the whole supply chain.

Priority 3. the standardization and quality management for the flows

The standardization management and the quality management are the important factors that related to the successful implementation of the VMI strategy. The suppliers and the Suning company make the flow management together including the standardization management, the required planning, the replenishment planning, and the distribution rules. The raw materials' quality assurance should be made by the suppliers.

Priority 4. the completed information system

The share of the information is the basis for the realization of the VMI. The coordinated operation of the VMI information system is founded on the qualified transfer and share of the information among the links in the supply chain. So, the VMI can't be effective without the support of the information technology. The Suning company's information technology system is one of the most advanced systems in the retail industry in China. The successful implementation of the SAP/ERP system within the company generates 3 breakthroughs on the management. Firstly, the integrated management mode, which integrates the management of the investment, the businesses, the financial, the service, and

the human resources. And the goal of the mode focuses on the input and the output, the costs and the profits. The accounting unit is by individual, or by departments, or by the whole company. Secondly, the realization of the inter-company management. The core values of the chain operation are the centralized procurement, the centralized marketing, the centralized distribution. Because of the limitations from the legal policy, the chain enterprises used to register and operate independently. Now, with the adoption of the SAP/ERP system, the problems are solved. Finally, the inter-regional operation. With the development of the chain scale, and the adaptation of the external environment. The headquarter's functions have to be split into different regions to achieve the best results. The effective applications of the advanced information technology has pushed the VMI into a boom development. It can be used to save the time and increase the precision of the information exchange, reduce the artificial mistakes during the complicated and repeated working process, which increase the effectivenesses of the VMI in the supply chain.

4.2 steps for Suning to implement VMI

The number of the steps for the Suning company to implement the VMI is 7. the first 4 steps concentrate on the preparations for the management structure, the rest 3 steps focus on the implementations of the VMI system.

The first step is the internal evaluation of the Suning company. Before the implementation of the VMI, both the suppliers and the Suning company should make the internal evaluations of their own enterprise, to consider that whether to implement the strategy or not, what essential profit it can bring, which partners to choose and so on. The items need to be evaluated include the strategic goal of the company, the costs and the benefits (labor forces, the time, the system and ect.), the external factors (the customers' demand) and so on. This phase is to get the consensus and the commitments among the persons in charge of the various departments in the enterprises.

The second step is the high level talks between the managers from the suppliers and the Suning company, which aims at building a preliminary consensus, and then setting a

common goal. Again, there should be an internal consensus between the companies. Finally, the two sides sign an agreement to promise the specific related regulations.

The third phase is to set up an implementation team. Both the suppliers and the Suning company establish the corresponding communication windows, and set up the responsible groups to be in charge of the communication. Finally, form a cross-company specific group. Generally, it's hard for the person who is in charge of the communication group to control all the members, he needs to get the help from the head managers of the departments to ask the members to deal with the cases. So, from the experienced companies, they advise that the communication responsible team should be evaluated in the end-year performance evaluation plan to implement the plan smoothly.

The fourth stage is to formulate the score sheet and examine the results. In order to make the comparisons between the pre-implementation and the after implementation and also improve the results. There should be a score sheet to evaluate the results periodically. The templates of the score sheet can be taken from the companies which are implementing the VMI strategy added with the sales from the suppliers'. Besides, the inventory indexes of the Suning company should also be including the products on the shelf. However, the data collection of the products on shelf is not that easy at this time, so, they can make some probable estimations. Anyway, the both two sides should keep the same calculation standards and methods to ensure the same benchmarks between the two sides. The examination time should be agreed by the two sides, normally, there will be high frequent examinations in the beginning, for example, once in a week, and make some notes during the process for the examination time to find out the reasons. At the end, the two sides would sign a contract to set up the formal implementation mode.

The fifth step is the information docking phase. The internal system of the Suning company directly docking to the suppliers' system. The suppliers can enter the Suning company's system to observe the sales progress and the inventory status from time to time, which can reduce the communication cost and the labor intensity. In the mean time, by using the market information that get from the Suning company, the suppliers can eliminate the excessed inventory, produce the suitable goods with quicker response. In such circumstance, the supply chain can be improved in this good cycle.

The sixth stage is the examination phase which means to continually adjust the operation patterns and flows to coordinate the practical operation. So, there must be some frequent communication meetings to solve the problems raised from the fourth stage. The strategy can be implemented when the system and the operation pattern tend to be stable.

The last step is to put the strategy formally on line. The premise of this step is that the frequency of the modified order reduces to a certain level in the Suning company's logistics center. And the specific timing depends on the trust level between the two sides. sometimes, they can decide to put a portion of products to be in the VMI pattern, and then develop the whole plan. During the practical implementations, there are two guidelines for references. Including the protocols before the implementations and the daily routine workflow. The protocol before the implementation is the necessary agreement between the Suning company and its suppliers, the content comprises 5 items: the first protocol is the negotiation of the safety stock. The second protocol is the negotiation of the lead time. The third one is the negotiation of the minimum order quantity. The fourth protocol is the negotiation of the promotional merchandises. The fifth protocol is the negotiation of the demands for different seasons.

4.3 economic benefits generated by VMI strategy

The reduction of the inventory management cost can force the Suning company to concerntrate on the core competencies, and it can also decrease the stockout rate and the backlog rate. The reduction of the supply chain cost can lead to the lower price of the end products ultimately, which can enhance the competitiveness and the sales.

With the control of the end demand information, the suppliers can get more precise forecastings which can be used to arrange the effective production schedule, make the proper procurement plan, produce the goods according to the customers' requirements, raise the quality of the products, eliminate the additional costs from the unexpected short term products. What's more, the long term strategic relationship and the effective negotiations are good for the suppliers to keep the market share in the competitive market.

The suppliers can have more professional production management, realise more effective inventory management and ordering decision, at the same time, cut down the transaction time and costs of the procurement orders, the invoices, the payments, the transportation, the receiving goods. These behaviors can enhance the partnership between the two sides for the better development in the future. After the implementation of the VMI strategy, the Suning company transfers the inventory management rights to the related suppliers, in this way, the profits increase obviously. However, despite of the the increased contract price for the goods can't make up to the higher level inventory control costs. So, although the suppliers' profit decreases, the whole supply chain's profit increases. In practice, in order not to influence the suppliers' activity to implement the VMI, the Suning company can pay back some fractional of the profit to the suppliers which amount at least equals to the loss of the profits. In this way, there will be no lack of the credit phenomenon and can increase the stability of the whole supply chain.

5. analysis of outsourcing VMI for Suning

5.1 analysis of VMI flow responsible by 3PL

5.1.1 flow of VMI responsible by 3PL

First of all, the 3PL participate the activity of forecasting the customers' demand and making the different preproduction plans based on the connection of the forecasting system and the production system with the Suning company. At the same time, according to the production and availability capacity of the suppliers, the 3PL set the safety stock for the suppliers as the buffer for the Suning company's requirements. And then decide the schedule and the amount of the replenishments from the separate suppliers to the 3PL according to the inventory status, the forecasting demand as well as the safety stock levels. The goods kept in the 3PL's warehouses belongs to the respective suppliers. The Suning company firstly sends the orders to the TLP, then the 3PL organize the transportations for the suppliers to the customers, finally accomplish the transfer of the ownership of the goods, and the Suning company is responsible for the settlement with the suppliers.

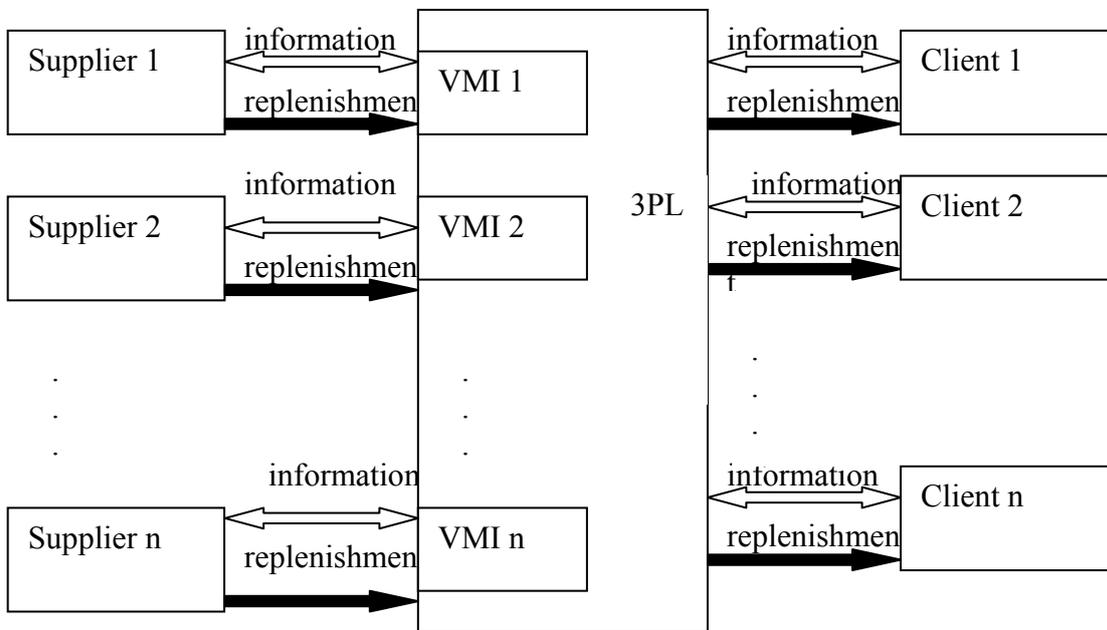


Figure 5-1 the flow of the third party responsible VMI

5.1.2 advantages of outsourcing VMI

Compared to the original VMI flow, the implementation of the 3PL responsible VMI concentrates on the playing the core advantages and the bridge function of the 3PL companies in the supply chain. Such as the 3PL hold the professional equipment, technologies and services during the logistics process. For the 3PL companies are the companies that specialized in the logistics services, so they can take advantages of the strategic and operational activities to get the advanced technologies and management experiences under the condition of reduced relevant costs. Also, the 3PL companies play important role in the process of the information transmission and share. With the free enter of both the suppliers' and the Suning company's information systems, the 3PL can collect the accurate demand data to reflect the market situation, which can effectively eliminate the Bullwhip effect. At the same time, the 3PL companies can further integrate the the logistics resources. As a retailer, the Suning company definitely has many suppliers, and

sometimes, one supplier provides more than one kind of products, the logistics routes are scattered. But through the 3PL, the transportations and the storages of the goods can be integrated, which will decrease the total logistics costs. What's more, the 3PL can share the risks with the suppliers and the Suning company together. With the large scaled economical operation method, the 3PL can reduce the risks transferred from the partners. In the VMI warehouses, the 3PL can deploy the inventory freely to minimize the risks.

5.2 attentions Suning should pay on the outsourcing

The 3PL responsible VMI is an effective way to implement the VMI, however, it is not an omnipotent strategy. The Suning company should pay attention to the conditions of the implementation.

Firstly, the Suning company should make the feasibility analysis for the 3PL companies to implement the VMI. There are 2 determinants ahead of choosing a 3PL to be responsible for the logistics or not, one factor is that how much critical is the logistics work for the Suning company and the how good management capacity of it. If the customers have high level requirements for the service level, the logistics costs take large proportion of the total costs, and there are high experienced people managing the logistics inside the Suning company, then there's no need to outsource the logistics activities, instead, they can manage it on their own. For example, the Walmart manages the VMI itself. The other factor is that, for the Suning company, logistics is not its core strategy of all the businesses, and the internal logistics management level is not so high. So, the outsourcing activity of the logistics to the 3PL company can effectively reduce the costs and increase the service level.

Secondly, the Suning company should realize that the profits from the implementation of the outsourcing VMI increases as time goes on. Generally, the partners can't get the expected profit at the beginning of implementing the VMI. But as time goes on, the effects will appear.

Thirdly, the trust issue is the key problem between the Suning company and the 3PL company. The 3PL can access the Suning company's as well as the suppliers' IT system

with maximum permissions, and participate the management activities. During the activities, the 3PL would inevitably involve in the core business secrets, under such case, the 3PL have the absolute obligation of confidentiality. The Suning company can establish the strategic alliances with the 3PL to solve the trust issue during the implementation of the VMI. The strategic alliance is a behavior of chasing the common interests for the partners who hold the different resources from the integration of the resources point. The partners can sign the long term mutually beneficial agreements to realize the share of the resources and the opening of the new markets. As a new method for the enterprises to create the value, the strategic alliance has gradually become a consensus for the global business administration industry. Generally, the cooperations between the 3PL and the enterprises is a gradual process. When the enterprises decide to outsource the logistics, they can firstly outsource some logistics jobs which are not so important to the 3PL companies. Through the results of these jobs, the enterprises can evaluate the effects and deepen the cooperation area. Through the several times' cooperation, the two sides can build up the long term partnership. The strategic cooperation among the upstream and downstream companies as well as the 3PL companies is an effective way to solve the trust issue within the VMI, at the same time, the basis of the cooperation relationship is the mutual benefit, which is also helpful to evaluate and balance the benefit produced from the VMI.

Fourthly, the sudden change of the customers' demand would make the 3PL responsible VMI invalid. Because no matter how advanced the forecasting system is, it is on the basis of analyzing the historical data according to some specific methods. It may be accurate, however, it's not the true reflect of the real market demand. The development of the real demand is not followed by the people's will. And once the non-regular changes happen, the forecasted data would have certain deviations compared to the real demand, and then the wrong inventory analysis leads to the irrational inventory control. Generally, the sudden change of the market demand usually occurs in separate markets, even if this situation happens, the 3PL companies can switch on the goods turnover system to deploy and transport the goods.

5.3 Suning's selection of 3PL

In order to ensure the continued and stable logistics services when the Suning company has decided to outsource most of the logistics job to the 3PL companies, at the same time, raise the rate of investment under the consideration of the actual situation of the enterprise itself. So, the proper choice of the 3PL company is very important. And the suggested method is the Fuzzy Analytical Hierarchy Process(FAHP).

5.3.1 Analytical Hierarchy Process

Analytical Hierarchy Process, is a decision analysis method proposed by American operational researcher T.L.Saaty in 1970es, which combines qualitative and quantitative analysis together. AHP is a process which modelizes and quantifies the complicated decision process. By using this method, the decision makers can obtain the weights for the different programs through decomposing the complicated problems into several levels and elements. And the weights can be provided as the basis of choosing the 3PL partners(Mu Jiangkang,2007).

The basic principles of the AHP are to decompose the problem into several components, and form the hierarchical structure by the sequence of setting the overall objective, the subgoals, the evaluation criterias till the specific measures. Determine the relative importance of every element by pairwise comparison, then by using the method of solving the judgment of the eigenvectors of the matrix to get the weights of the every element on every level towards the every element on the last level. At last, sum up the weights and merge hierarchically to get the respective weight to the overall objective. The best plan of all is with the biggest weight value. The key part of the AHP is the establishment of the decision matrix, and whether the matrix is scientific or not would directly influences the effects of the AHP. However, the AHP still exists some shortcomings, for example, it's difficult to judge the consistency of the matrix, the adjustment and the test for the new matrix is a cumbersome process. Or the judgement of the consistency of the matrix is totally different from the consistency of the human thinking(Mu Jiangkang,2007).

5.3.2 Fuzzy Analytical Hierarchy Process

Fuzzy Analytical Hierarchy Process(FAHP) is improved from the traditional analytical hierarchy process, which is an effective production of the combination of the fuzzy math and the hierarchy process. There are 2 kinds of FAHP, one is based on the fuzzy number, the other is based on the fuzzy matrix, and this thesis focuses on the fuzzy matrix. The basic concepts and steps are as same as the AHP's. But the FAHP modifies the structure and the measurements of the decision matrix, which makes the test of the consistency and the adjustment more scientific, more accurate, and simpler, to a large extent, make up some of the shortcomings of the AHP(Zhang Jijun,2000).

5.3.2.1 related concepts of FAHP

Concept 1: if one matrix $R=(r_{ij})_{n \times n}$ satisfies the condition that $0 \leq r_{ij} \leq 1$ ($i=1,2,\dots,n,j=1,2,\dots,n$), then R is the fuzzy matrix.

Concept 2: if one matrix $R=(r_{ij})_{n \times n}$ satisfies the condition that $r_{ij} + r_{ji} = 1$ ($i=1,2,\dots,n,j=1,2,\dots,n$), then the fuzzy matrix is the complementary matrix.

Concept 3: if the fuzzy matrix $R=(r_{ij})_{n \times n}$ satisfies that $\forall i, j, k \ r_{ij} = r_{ik} - r_{jk} + 0.5$, then the fuzzy matrix R is the fuzzy consistent matrix.

When we use the FAHP, we should have a quantitative description of the relative importance the element a_i to a_j . In order to define the relative importance the element a_i to a_j , the number range 0.1-0.9 can be measured.

Table 5-1 the judgement scale from 0.1 to 0.9

scale	definition	explanation
0.5	equally important	2 elements are equally important compared to each other
0.6	a little more important	1 element is a little more important than the other
0.7	obviously more important	1 element is obviously more important than the other
0.8	much more important	1 element is much more important than the other
0.9	extremely important	1 element is extremely more important than the other

0.1 0.2 0.3 0.4	On the contrary	If we get the judgement figure r_{ij} after comparing a_i to a_j , then the judgement figure would be $r_{ji}=1-r_{ij}$ if we compare a_j to a_i .
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The consistency test of the FAHP is based on the following theorems.

Theorem 1: a sufficient and necessary condition for the fuzzy complementary matrix to be a fuzzy consistent matrix is that the difference between a fixed line and the rest of the lines is a constant.

5.3.2.2 steps for companies to select 3PL by FAHP

Step 1: build up the hierarchical structured model

We divide the evaluation model of the 3PL to 3 parts

The top level A, which represents the purpose of selecting the 3PL

The middle level B, which represents the involved principles when adopting some plan to realize the goal, and that means the evaluation indexes of the 3PL in this case.

The lowest level S: all kinds of plans to solve the problem which means the 3PLs to be evaluated.

Step 2: establishment of the fuzzy judgement matrix

Fuzzy judgement matrix is the matrix which indicates the importance of the comparison between one certain level and the other certain level. For example, if the elements of one certain level A have relationship with the next level elements of B. then the fuzzy judgement matrix demonstrates the importance of them is like:

$$A = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \dots & \dots & \dots & \dots \\ a_{n1} & a_{n2} & \dots & a_{nm} \end{bmatrix}, \text{ and } a_{ij} \text{ in this matrix shows the importance of the } B_i \text{ to } B_j$$

related to the element A. and the values for them referred to Table 5-1.

Generally, enterprises hire experts or professionals to compare the importance of the elements in the same level of the hierarchy based on the enterprises' own situation and the current market conditions and so on, which finally form the fuzzy judgement matrix. The

numbers in this matrix only related to the operational needs of the enterprises and the current market environment, and they are independent of the selected 3PL company. So, the targets calculated from the fuzzy judgement matrix can be used for choosing the 3PL, what's more, the index is relatively stable within a certain period of time.

Step 3: consistency testing and adjustment of the fuzzy judgement matrix

FAHP needs to have consistency testing and adjustment on the established fuzzy judgement matrix to make it logically consistency. Firstly, carry on the consistency testing for the established fuzzy judgement matrix, if it is not a fuzzy consistent matrix, then we should adjust it into the fuzzy consistent matrix using the theorem 1. when it comes to the adjustment methods, there are mainly two ways: one is to define a satisfying consistency standard, and according to this standard, adjust the elements in the matrix to achieve a satisfying consistency. The other way is to use some mathematical transformations to make the initial judgement matrix have the complete consistency. And in this thesis, we use the later method to adjust the judgement matrix. The specific operations are inside the theorem 2.

Theorem 2: construct the fuzzy consistency matrix from the fuzzy complementary matrix.

Sum up the fuzzy complementary $A = (a_{ij})_{n \times n}$, denoted as $r = \sum_{k=1}^n a_{ik}$ ($i=1,2,\dots,n$), then

implement the transformation like: $r_{ij} = \frac{r_i - r_j}{2(n-1)} + 0.5$ formula(5-1).

to get the fuzzy consistency matrix $R = (r_{ij})_{n \times n}$.

Step 4: hierarchy bill ranking

Hierarchy bill ranking means the ranking of the importance of the elements in one certain level compared to elements of the last level. And the ranking can be obtained by the following calculations:

Suppose the importance vector of this level is $[\omega_1, \omega_2, \dots, \omega_n]^T$,

$$\omega_i = \frac{1}{n} - \frac{1}{2a} + \frac{1}{na} \sum_{j=1}^n r_{ij}, (i=1,2,\dots,n) \quad \text{formula(5-2)}$$

n is the order of R, $a = \frac{n-1}{2}$

When select the 3PL using the FAHP, this step is to calculate and adjust the index weight of the fuzzy consistency matrix according to the formulas.

Step 5: general hierarchy ranking

The process of the general hierarchy ranking is to strike the sum of the weights come from the results of the hierarchy bill ranking. The general hierarchy ranking of the k level to the first level is like:

$$W_k^i = \prod_{j=2}^{j=k} \omega_j^{j-1} = W_2^1 \times W_3^2 \times \dots \times W_{k-1}^{k-2} \times W_k^{k-1} \quad \text{formula(5-3)}$$

And, $W_k^{k-1} = (W_k^1, W_k^2, \dots, W_k^{k-1})$, k indicates the the weights distribution of the elements in the k-1 level. This step aims at calculating the total weights of every evaluating index to the overall objective.

Step 6: calculate the comprehensive evaluation value

Suppose the experts get the quantization values of the indicators after the dimensionless treatment are $R(X_i) = (X_{i1}^*, X_{i2}^*, \dots, X_{in}^*)$, and the weights of the every index to the overall objective are $W = (\omega_1, \omega_2, \dots, \omega_n)^T$. Finally, if we multiply the two parts, we can get the final score of this 3PL:

$$S_i = R(X_i) \times W = [X_{i1}^*, X_{i2}^*, \dots, X_{in}^*] \begin{bmatrix} \omega_1 \\ \omega_2 \\ \dots \\ \omega_n \end{bmatrix} \quad \text{formula(5-4)}$$

5.3.2.3 advantages of FAHP in the selection of 3PL

The FAHP is a method that breaks down the complicated process into various elements, classify these elements into groups according to the dominance relationship to make it a ordered hierarchical structure. And through pairwise comparison to judge the relative importance of the elements in every level, then get the weights of the elements in the comprehensive evaluation, finally evaluate the elements comprehensively according to the membership and the weights. The FAHP has certain advantages in the selection and evaluation process of the 3PL.

Firstly, the selection of the 3PL company is a multi-objective evaluation problem which contains qualitative factors as well as quantitative factors. And the ideas of the FAHP are simple, which combines the qualitative analysis and the quantitative analysis together organically. It makes the people's thoughts digitalized and systematized to be easily

calculated and accepted, which makes the optimization of the multi-level and the multi-objective effective.

Secondly, the FAHP satisfies the features of the evaluation index system when choosing a 3PL company. Since the evaluation index system for the 3PL is structured under the different levels and different categories. For instance, there's the rule layer under the target layer. The indexes of all aspects influence the selection and the evaluation of the 3PL are interactive and mutual constraintive. The different categories in the rule layer are influenced by various factors, which can be broken down into different sub-indexes. The alternative 3PL companies are the different plans. So, all of these indexes or layers make the multi-level structure very complicated. However, the FAHP searches the complicated problem step by step, and finally find out the proper plan satisfying the target level. So, choosing the FAHP as the method to select the 3PL company is feasible.

Thirdly, the selection of the 3PL company contains a lot of the uncertain factors, not only the objective reasons like the fuzzy things or hard to quantitative, but also the subjective reasons like the enterprises themselves. The FAHP brings the thoughts and methods of fuzzy comprehensive judgement into the choose of the 3PL, which fully considers the uncertain factors and the subjective factors. Based on the qualitative and quantitative analysis, the FAHP quantitative the qualitative factors and fuzzy factors, which make the evaluation of the 3PL easy to grasp, and also solve the shortages and problems of the traditional way of choosing the 3PL.

Finally, the FAHP is developed and improved from the traditional Analytical Hierarchy Process(AHP). It is more scientific and simpler during the practical implementations. In addition, the FAHP has already been a relative mature theory, and a lot of experiences can be learned as the references, which have been proved to be practical and reliable. In this thesis, I would pick the FAHP method to choose the 3PL company for the Suning company.

5.3.3 dimensionless method of the evaluation indexes

In the evaluation index system of choosing the 3PL, the evaluation indexes have different meanings and manifestations, some of them are absolute indexes, and some of them are relative indexes. Likewise, the indexes have different effects and trends on the evaluation

system, some of them are positive indicators, some are appropriate indicators, some are inverse indexes. For the positive indexes, the bigger number, the better effects. For the appropriate indicators, the number's better to be proper. On the contrary, for the inverse indexes, the smallest number, the better effects. So, we can't just have comparisons among these indexes. If we don't carry on the dimensionless method, we can't make the comprehensive evaluation.

The dimensionless process is a method that standardize and normalize the number of the evaluation indexes through certain mathematical transformations to eliminate the influences of the dimensionless indexes, which means to transform the indexes with different characters and dimensions into relative numbers which can be comprehensively evaluated.

1. linear dimensionless process

Linear dimensionless process is the method which people always use to cope with the indexes. Its content is that when transforming the actual indexes into the dimensionless indexes, suppose they are linear related, which means the changes of the actual indexes influence the dimensionless indexes to be corresponding changes in certain proportions. There are mainly two ways of coping with the linear dimensionless.

Method 1. extremum method. Take advantage of the extremums(either maximum or minimum) of the indexes to calculate the dimensionless values. Suppose the quantization value of the index i is x_i , the dimensionless value is x_i^* , so the main calculating formulas are :

$$x_i^* = \frac{x_i}{\max x_i} \quad \text{formula(5-5)}$$

$$x_i^* = \frac{\max x_i - x_i}{\max x_i} \quad \text{formula(5-6)}$$

$$x_i^* = \frac{x_i - \min x_i}{x_i} \quad \text{formula(5-7)}$$

$$x_i^* = \frac{x_i - \min x_i}{\max x_i - \min x_i} \quad \text{formula(5-8)}$$

However, this method exists serious shortages. That is it doesn't consider the effects and the trends the indexes to the objective function. In a complete system, the common existences of the positive indexes, appropriate indicators, and inverse indexes are

inevitable. For most of the indexes, the influences of the variations of the actual indexes to the quantitative values are not proportional correspondingly. If we simply solve it with linear method, then we can't get the actual contributions of the every index to the objective.

Method 2. Standard deviation method.

$$x_i^* = \frac{x_i - \bar{x}}{S} \quad \text{formula(5-9)}$$

And $\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$, $S = \sqrt{\frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2}$. If the original data is normally distributed, then the transformations of the data are reasonable by using this method.

2. non-linear fuzzy dimensionless process

The linear dimensionless process is simple and easily handled, the workload is small. But this kind of method has shortages. Sui minggang uses the maximum values, the minimum values, the average values as the standards in the scoring system according to the membership function concept in the fuzzy math, and deal with these three indexes with dimensionless process correspondingly. This method corresponds to 3 dimensionless models, they are positive indexes fuzzy quantification model, negative indexes fuzzy quantification model, and appropriate indexes fuzzy quantification model. And I would use this method to make the dimensionless process for the indexes of the Suning company in this thesis.

The positive indexes fuzzy quantification model

$$R(x_j) = \left\{ \begin{array}{l} \frac{1}{2} + \frac{1}{2} \sin \left[\frac{\pi}{x_{j\max} - x_{j\min}} \left(x_j - \frac{x_{j\max} + x_{j\min}}{2} \right) \right], x_{j\min} \leq x_j \leq x_{j\max} \\ 0, x_j > x_{j\max} \text{ or } x_j < x_{j\min} \end{array} \right\} \quad \text{formula(5-10)}$$

negative indexes fuzzy quantification model

$$R(x_j) = \left\{ \begin{array}{l} \frac{1}{2} - \frac{1}{2} \sin \left[\frac{\pi}{x_{j\max} - x_{j\min}} \left(x_j - \frac{x_{j\max} + x_{j\min}}{2} \right) \right], x_{j\min} \leq x_j \leq x_{j\max} \\ 0, x_j > x_{j\max} \text{ or } x_j < x_{j\min} \end{array} \right\}$$

appropriate indexes fuzzy quantification model

$$R(x_j) = \left\{ \begin{array}{l} \frac{1}{2} + \frac{1}{2} \sin \left[\frac{\pi}{x_{j\text{mod}} - x_{j\text{min}}} \left(x_j - \frac{x_{j\text{min}} + x_{j\text{mod}}}{2} \right) \right], x_{j\text{min}} < x \leq x_{j\text{mod}} \\ \frac{1}{2} - \frac{1}{2} \sin \left[\frac{\pi}{x_{j\text{max}} - x_{j\text{mod}}} \left(x_j - \frac{x_{j\text{max}} + x_{j\text{mod}}}{2} \right) \right], x_{j\text{mod}} < x < x_{j\text{max}} \\ 0, x_j > x_{j\text{max}} \text{ or } x_j < x_{j\text{min}} \end{array} \right\}$$

In the formulas, $R(x_j)$ is the evaluation value processed by the dimensionless method, x_j is the original evaluation value for the j-th item, $x_{j\text{max}}$ is the maximum number of the evaluation value among the scoring system of the evaluation indexes, $x_{j\text{min}}$ is the minimum value of the evaluation value among the scoring system of the evaluation indexes, $x_{j\text{mod}}$ is the most moderate number of the evaluation value among the scoring system of the evaluation indexes. After the above processes, the obtained results are all between 0 and 1. then, after the weighted average of these values, we can compare the final scores directly.

5.3.4 selection of Suning's 3PL

Firstly, the general thinking of choosing the 3PL enterprise for the Suning company is that: determine the evaluation indexes system for the hierarchy and the alternative 3PL companies, construct the hierarchy structure model for the interconnected factors. Define the weights of the evaluation indexes system by means of the fuzzy analytical hierarchy process, process the each evaluation index data of different 3PL enterprises with dimensionless method, then calculate the the scores of the evaluation for the 3PL enterprises, finally, choose the proper 3PL enterprise.

5.3.4.1 determine the evaluation index system for 3PL companies

According to the actual situations and the features of the Suning company, I would establish the comprehensive hierarchy evaluation index system targetly to choose the 3PL enterprises. The information technology capacities, the logistics costs, and the logistics service level are the main index factors in choosing the 3PL enterprises. Besides, the customer service and the partnership should also be included. So, through the above analysis. The evaluation index system for the Suning company is performed as follows:

Table 5-2 the evaluation index system for the 3PL companies

main evaluation indexes	codes	refined indexes	codes
SC management capacity	B1	design and develop capacity	C1
		resource allocation capacity	C2
logistics quality	B2	breakage of the goods	C3
		rate of delivery on time	C4
		rate of errored delivery	C5
information system level	B3	stability of the system	C6
		flexibility of the system	C7
service pricing	B4	service pricing	C8
partnership	B5	cooperative attitude	C9
		cooperation outlook	C10

5.3.4.2 determine the alternative 3PL companies

In order to obtain the satisfying 3PL company among the various alternatives, the Suning company firstly have preliminary screening of all the companies according to the principle of veto indexes, and choose 3 of the 3PL companies as the quite satisfying companies.

5.3.4.2 determine the alternative 3PL companies

After determining the evaluation index system and 3 alternative 3PL companies for the Suning company. The construction of the hierarchy structure model using FAHP should be performed.

The top level A: the target level-choose the best 3PL for the Suning company

The middle level B: the principle level-choose the main evaluation indexes for the system.

The middle level C: the sub-principle level-the refined indexes for the system.

The lowest level S: the plan level-the 3 alternative 3PL companies.

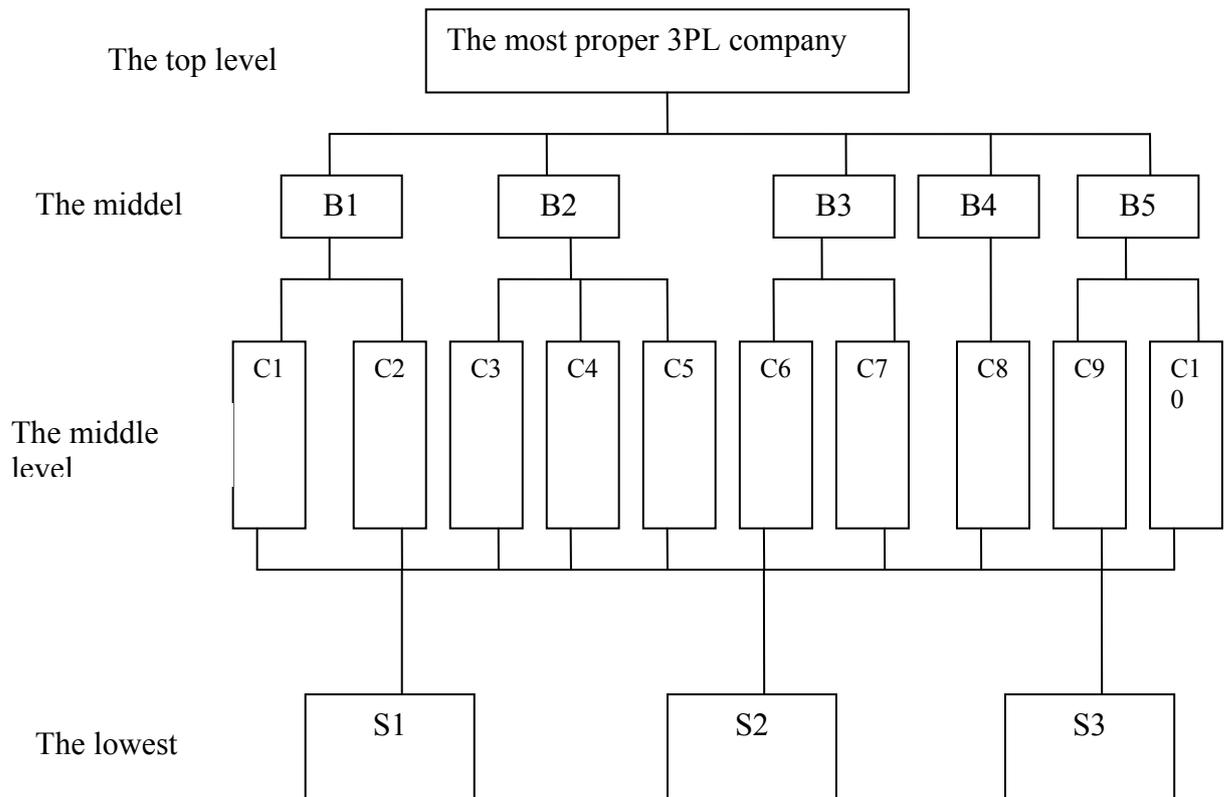


Figure 5-3 The Flow Chart of the Hierarchy Structure Model for the Choice of the 3PL Company.

5.3.4.4 determine the weights of indexes in the evaluation system

Make the pairwise comparisons of the importance of the indexes in the same level, structure the fuzzy judgement matrix of A-B which is shown in the table 5-3:

Table 5-3 Pairwise Comparisons of the Importance of the Indexes in the Same Level

A	B1	B2	B3	B4	B5
B1	0.5	0.6	0.6	0.8	0.7
B2	0.4	0.5	0.5	0.6	0.6
B3	0.4	0.5	0.5	0.7	0.6
B4	0.2	0.4	0.3	0.5	0.4
B5	0.3	0.4	0.4	0.6	0.5

According to the formula(5-5), after some mathematical transformations to the matrix A-B to get the fuzzy consistent matrix of A-B. and also with the use of the formula(5-5), calculate the weights ω_i which show the factors in the level B relative to the factors in level A. the results are listed in the table 5-4:

Table 5-4 fuzzy consistent matrix of A-B

A	B1	B2	B3	B4	B5	ω_i
B1	0.5000	0.5750	0.5625	0.6750	0.6250	0.2438
B2	0.4250	0.5000	0.4875	0.6000	0.5500	0.2063
B3	0.4375	0.5125	0.5000	0.6125	0.5625	0.2125
B4	0.3250	0.4000	0.3875	0.5000	0.4500	0.1563
B5	0.3750	0.4500	0.4375	0.5500	0.5000	0.1813

Similarly, formulate the fuzzy judgement matrix of B-C correspondingly, and test the consistency of the fuzzy judgement matrix. Through the calculations, I can get the weights of the factors in level C compared to the factors in level B.

Table 5-5 the fuzzy consistent matrix for B1

B1	C1	C2	ω_i
C1	0.5	0.6	0.6
C2	0.4	0.5	0.4

Table 5-6 the fuzzy consistent matrix for B2

B2	C3	C4	C5	ω_i
C3	0.5000	0.3500	0.3500	0.2333
C4	0.6500	0.5000	0.5000	0.3833
C5	0.6500	0.5000	0.5000	0.3833

Table 5-7 the fuzzy consistent matrix for B3

B3	C6	C7	ω_i
C6	0.5	0.7	0.7
C7	0.3	0.5	0.3

Table 5-8 the fuzzy consistent matrix for B5

B5	C9	C10	ω_i
C9	0.5	0.4	0.4
C10	0.6	0.5	0.6

After all the above calculations, I would integrate the weights, and the results are shown below.

Table 5-9 the final weights of the indexes

A	B1	B2	B3	B4	B5	weights
	0.2438	0.2063	0.2125	0.1563	0.1813	
C1	0.6					0.14628
C2	0.4					0.09752
C3		0.2333				0.04813
C4		0.3833				0.079075
C5		0.3833				0.079075
C6			0.7			0.14875
C7			0.3			0.06375
C8				1		0.1563
C9					0.4	0.07252
C10					0.6	0.10878

So, from the weights in the table , and according to the requirements for the 3PL companies of the Suning company, and also combine the industry characteristics and levels of the 3PL field. The Suning company can get the maximum and minimum values of the each evaluation index through the complete analysis. Then, compare the evaluation indexes of the alternative 3PL with the supposed values set by the company itself. Finally, the Suning company can choose a 3PL company to build up the strategic cooperation relationship, or make other feasible alternative plans.

6. summary

6.1 main conclusions

In the 21st century, the competitions among the organizations in the global market become more and more fierce. The thinkings of the supply chain have got the widely improvement from the managers. And the VMI concentrates on the cooperations between both the upstream and the downstream enterprises, as well as simplify the links in the supply chain, which turns out to be an effective management mode.

The third party logistics companies are responsible for the management of the vendor managed inventory, which also is the reflection of the core thinking of the supply chain. The 3PL fully play the advantages in the scale and the competition sides, and make the complementary of the advantages of the enterprises in the supply chain, which can strength the competition power of the supply chain. So, the 3PL responsible VMI can be widely implemented.

Take advantages of the 3PL theories, the VMI theories, the outsourcing of the logistics businesses, the problems that the Suning company is facing, as well as the actual situation of its own. Through the combination of the theories and the practices and the deep analysis and the discussions, the following conclusions can be made:

1. the implementation of the VMI strategy within the Suning company is feasible. The results of the study showed that the total profit for the company increased after the implementation of the VMI, however, the profit for the suppliers reduced a little bit. So, the Suning company can return a proportion of the profit to the suppliers in order to motivate them, which can truly achieve the goal of sharing the profits.
2. the basis for the realization of the VMI are the mutual trusts and the long term membership. So, whether the partner is strong or weak, it should consider the benefits for both sides, the suppress on the weak side is impossible. At the same time, the construction of the information system before the implementation of the VMI is needed, which includes the construction of the unified information platform, the EDI system, the POS system, the coding technology, and the ID technology. And all of these constructions are the key elements of the successful implementation of the VMI.
3. whether the Suning company's VMI strategy based on the outsourced 3PL can be implemented successfully or not, the selection of the proper 3PL company is very important.

6.2 further study

The 3PL company selection for the Suning company to be responsible for the VMI, besides the research content in this thesis, there are also some other problems to be studied:

If the cycle time of the outsourcing contract is too short, then the 3PL company would lower the service level due to the reason that the input of the company can't be recycled in time. And if the cycle time is too long, then the 3PL company would lower the service level due to the lack of the sense of urgency. So, how long time the cycle time should be is the next problem to be considered.

After the outsourcing of the logistics work to the 3PL company, the Suning company has to think about how to arrange and use the existing logistics equipment and the related labor forces, and especially the people, which can be a big obstacle in front of the implementation of the strategies.

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Appendix- full details of interview

Location: Suning Company's Reception Room

Interviewee: Dai Xinming

Interviewer: Li Chunfang(LCF)

Abstract

The interview is carried on 12th April in the reception room of the Suning company at 2pm. Mr Dai is a person who is in charge of the logistics management department in Suning company. I am so honored to directly ask him the logistics affairs both internal and external. And the following questions are consolidated summary of the interview.

Question 1:

LCF: Would you please give me a short introduction of the development of the Suning Appliance company.

Question 2:

LCF: what do you think the present status of the Suning company in the appliance industry in China? And what about the future of this company?

Question 3:

LCF: Then what about the development of your department, what are the milestones of the logistics department?

Question 4:

LCF: Are there any problems existing in the logistics work, or in the Suning's supply chain?

Question 5:

LCF: I know that Suning has already adopted the VMI strategy, but do you think of outsourcing the VMI?

Question 6:

LCF: Mr Dai, according to your rich experiences in the management process of the logistics work in this company, please help me to fill in the following indexes to go on with the FAHP.

Table 1 the evaluation index system for the 3PL companies

main evaluation indexes	codes	refined indexes	codes
SC management capacity	B1	design and develop capacity	C1

		resource allocation capacity	C2
logistics quality	B2	breakage of the goods	C3
		rate of delivery on time	C4
		rate of errored delivery	C5
information system level	B3	stability of the system	C6
		flexibility of the system	C7
service pricing	B4	service pricing	C8
partnership	B5	cooperative attitude	C9
		cooperation outlook	C10

Table 2 Pairwise Comparisons of the Importance of the Indexes in the Same Level

A	B1	B2	B3	B4	B5
B1	0.5				
B2		0.5			
B3			0.5		
B4				0.5	
B5					0.5

Table 3 Pairwise Comparisons of the Importance of the Indexes in the Same Level

B1	C1	C2
C1	0.5	
C2		0.5

Table 4 Pairwise Comparisons of the Importance of the Indexes in the Same Level

B2	C3	C4	C5
C3	0.5		
C4		0.5	
C5			0.5

Table 5 Pairwise Comparisons of the Importance of the Indexes in the Same Level

B3	C6	C7
C6	0.5	
C7		0.5

Table 6 Pairwise Comparisons of the Importance of the Indexes in the Same Level

B5	C9	C10
C9	0.5	
C10		0.5

Thank you so much for your time!