



Master thesis

Improving Huawei international supply chain

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19th February 2007 – 6th September 2008

Executive summary

This report is based on a research of the supply chain of Huawei Technologies Netherlands B.V., the Netherlands branch of the Chinese company Huawei technologies.

To have an efficient and effective supply chain is crucial to success but at the same time a very challenging work, especially for a branch of an international company, because it has to seek balance between meeting local customer's specific demands and optimizing the benefit of the whole international company.

When entering a new market, the most important things for the supply chain are to understand the customer requirements, and to align the supply chain capabilities to the competitive strategy. The benefits of good strategic fit include cost reduction, due to economies of scale, and the transfer of knowledge and skills, as well as overcoming of cultural differences for international company.

Every company is exposed to all kind of external environments, the influence from them could be an opportunity to grow, or it can be a threat for the business. These opportunities and threats should be evaluated with the internal strength and weakness to come up with a suitable business strategy.

Long-term relationship building with supplier is very important for procurement activities. The mutual cooperation and commitment can strongly influence the performance of procurement and reach the five procurement principle. In order to meet its Benelux customers' requirements on product delivery, Huawei Technologies Netherlands outsourced several of their delivery and warehousing activities to local third logistic partners. This at the one hand can secure the warehousing and delivery activities due to the logistic partners' expertise and local experience, but at the other hand, the separation of business may also lead to the lack of communication and transparency, which may raise problems. So the question is about how these in-house and out-sourced supply chain activities should be integrated together to match the overall competitive strategy of the company and fit the external environment.

The actual performance of Huawei's supply chain is measured by using the Balanced Scorecard to have a consolidated view of supply chain performance. Improvement opportunities are found for further investigation of solution plans; the following points are where Huawei supply chain should further improve on:

- Inventory Turnover rate
- Inventory ABC Classification
- On time delivery rate
- Shipment visibility/traceability percent
- Transit time

From the implementation plan for each listed above, we conclude that the focus should be at the development of the information exchange platform between Huawei headquarter supply chain's system, Huawei Benelux supply chain's system, and out-sourced logistic service provider's system. This information exchange system is costly to invest and build, but the importance of the use of information exchange system, and the advantage could be realized eventually is widely realized by more and more international companies.

The development and upgrading of information exchange system should be carefully investigated and planned because it is not only to add some parts in the operation system technically, but it involves also "soft" parts. For example, the design principle and the way of working attached to the system and the personnel that will work on them, this is affected not only by different company culture but also by the cultural difference which is existed between Chinese and Western countries cultures.

A clear and strict organization arrangement such as information sharing and exchange policies and structure formats is required, This can help in overcoming cultural differences, and result in building and sustaining cooperation between internal and external parties of Huawei supply chain.

Preface

This report is the graduation project for the international management track (INT) of the department of business administration (MSc) of the University of Twente.

This report is the result of a research that started in the end of February 2007 during an internship at the supply chain department of Huawei Technologies Netherlands B.V., The research focuses on performance analysis and improvement implementation of Huawei's international supply chain management.

The first three months of the graduation project was aimed at theory research and information gathering in Huawei supply chain department. The following three months started the practical fulfillment the project.

I would like to thank the following people for all the guidance and assistance they made to this project. First of all is the graduation committee, and especially Dr. De Boer for their understanding, support and useful advice. Furthermore I would like to express my appreciation to all my colleagues in Huawei Technologies Netherlands B.V. who have cooperated with me and helped me in my academic and in my professional career, especially Dr. Wei Yi, the principle of this project and my manager at work, for all his encouragement and guidance.

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1. Introduction

This chapter presents an overview of the research and outlines the framework with which the problem is going to be solved. First, the background and objective of the research are described. Then, the problem formulation and research questions are outlined. Finally, the research approach and research structure are presented.

1.1. *Background and objective*

The Huawei Technologies Netherlands B.V. is the principal of this graduation assignment. The booming Chinese economy is bringing in a lot of foreign investment, but also encourages a lot of Chinese companies to go across the border to compete on the international market with foreign companies in local markets. Among them is Huawei Technologies. Huawei Technologies is one of the most internationalized companies in China. As of the end of Q3 2006, 68% of Huawei's contract sales were from the international market, and it has set up more than 100 branch offices in order to provide quick services to its customers.

In January 2005, after signing a contract with Telfort to supply the Dutch operator's UMTS network, Huawei Technologies decided to set up an office in Amsterdam. This is not only a representative office for sales, marketing and services, but also a logistics and training center as well as a research and development center for 3G services.

Since Huawei Technologies is based in an emerging economy, its familiarity with the local environment makes it easier to build its manufacturing and part of its supply chain in its home country at a comparatively low cost, which gives them a competitive edge compared to its competitors in local markets. But as for every global business its supply chain options are country-specific, which is very different from the Chinese market environment. Since there is comparatively little experience and knowledge about local supply chain options, the path of building an integrated supply chain model is not easy.

Huawei Technologies is a customer-oriented company with the company mission "To focus on our customers' market challenges and needs by providing excellent communications network solutions and services in order to consistently create maximum value for customers." Huawei Technologies has to take great effort in building a responsive supply chain to satisfy its customers' needs to win the market share. To date, in the Netherlands, Huawei has been selected by KPN and Telfort as their supplier, and works closely with them to ensure successful cooperation. Huawei aims to further develop strategic partnerships with more local operators.

Thus the objective of this thesis is to analyze and redesign the integrated supply chain between Huawei Technologies and Huawei Technologies Netherlands B.V. to better serve the Benelux customers.

1.2. Problem formulation

Based upon the background of the research and the formulated objective, the problem formulation is defined. The following aspects are considered in order to come to a well defined problem formulation:

- The objective of this assignment is not only to do an internal analysis of how Huawei Technologies' strategic competitive position influences its supply chain model choice but also to identify the external environment's requirements for the selection of supply chain model.
- Huawei Technologies Netherlands B.V.'s supply chain model should be compatible to the overall competitive strategy of Huawei Technologies.
- Huawei Technologies Netherlands B.V.'s supply chain model should react and adjust properly to the changing external environment ahead of its main competitors.

Based on the above statement, the problem can therefore be formulated as:

What improvements can be made in Huawei's international supply chain and how can these be implemented?

1.3. Research strategy

After the main problem of this thesis is formulated, a comprehensive analysis will be expanded into several aspects, which will be traced down in order to find the overall solutions to the problem.

In order to find the solution to the problem, it is necessary to understand the strategic position of Huawei's supply chain. The strategic position is based on the strengths, weaknesses, opportunities and threats around the Huawei supply chain to show the desired future position of Huawei supply chain on the basis of present and foreseeable developments. The aim of strategic positioning is to achieve strategic fit between Huawei's overall strategy and supply chain strategy. Therefore the work will start by understanding the vision, mission, goals, and strategies of Huawei and to learn its organizational structure and the responsibilities of Huawei's supply chain. And then finding out the requirements Huawei's supply chain should meet to achieve strategic fit through an internal and external environmental analysis.

Through understanding the factors that strategically influence supply chain performance; the next research question will be to assess the supply chain processes from operation point of view, main activities and processes of supply chain will be analysis from both supply side and demand side of Huawei supply chain.

Based on understanding of the supply chain assessment framework, the current performance of Huawei supply chain will be measured in the part; the main Key Performance Indicators (KPI for short) for measurement will be assessed and developed. The result of this chapter is to identify key weaknesses of the supply chain and analyzing them.

The last step is to find out what opportunities are most promising and what improvements can be developed. An action plan will be formulated for implementing the solutions.

1.4. Research questions

The basic logic of the breakdown into research questions is a strategy formulation since the problem formulation specifies a strategic view. This implies that an internal and an external analysis are carried out.

These research questions are:

- 1. What is the strategic position of Huawei supply chain?**
- 2. What is the operational situation of Huawei supply chain?**
- 3. What is the current performance of Huawei supply chain, and how to measure this performance?**

1.5. Research approach

This section specifies which research methods, sources and analysis instruments - are used in order to obtain the answers to the research questions.

The research we will perform is defined as Exploratory Research. 'Exploratory Research' is used when one is seeking insights into the general nature of a problem, the possible decision alternatives, and relevant variables that need to be considered. 'The research methods are highly flexible, unstructured, and qualitative, for the researcher begins without firm preconceptions as to what will be found.'¹

The main method of data collection is primary and secondary data; the Application of primary and secondary data is explained below:

Gathering the general knowledge about supply chain management is the first step of this exploratory research, in the chapter of "Models and theories", the data and information collected is mostly secondary data, is collected with the purpose of gathering the general knowledge about supply chain and its components, as well as all the theories and models

¹ [Aaker, Kumar & Day, marketing research, 1995]

related. The sources of these secondary data are articles and documents on supply chain management.

The chapter “strategic analysis” discusses the internal and external influence which affects supply chain performance, the data collected is mainly secondary data, the source of the data is Huawei’s website, employee training materials general website on company strategy, environmental factors’ influences on supply chain operation.

The chapter “operational analysis” discusses the four drivers from both supply and demand side of supply chain which determines the whole supply chain performance, the data collected is mixture of primary and secondary data, the source of these data come from the logistic operational report, department meeting minutes (primary data) and organizational chart, employee training materials, general website on company strategy, as well as other website and materials on environmental factors influence on supply chain operation (secondary).

The chapters “the measurement of supply chain performance” and “improvement and implementation” discuss the set-up of KPIs to indicate the current performance, as well as the result of the measurement. The data collected are mainly primary data, the sources of these data come from the operational report and figures collected from the MRP and CES systems, as well as survey, questionnaires and other observation tools which are carried in the supply chain department as well as other related departments.

1.6. Research structure

The research begins with the introduction, which includes the background and objective of this research, the problem formulation, as well as the research strategy and approach. Before the analysis takes place, the research models and theories which apply in this research are listed in the following chapter, giving an outline of how this research will be carried out and the main theories applied for problem solving.

Through the examination of internal and external strategic analysis, whether the supply chain fits the company strategy and the environmental needs will be analyzed. Following the exploration of supply chain itself, four drivers at both supply and demand sides of supply chain will be looked into, and see how they will “drive” the performance of the supply chain.

Then it comes to the measurement of performance, main KPIs will be developed and the current performance will be measured. Depending on the result of the measurement, the insufficient area of supply chain performance will be specified, the reason causing the insufficiency and the proposed solutions will be presented and finally lead to the implementation plans.

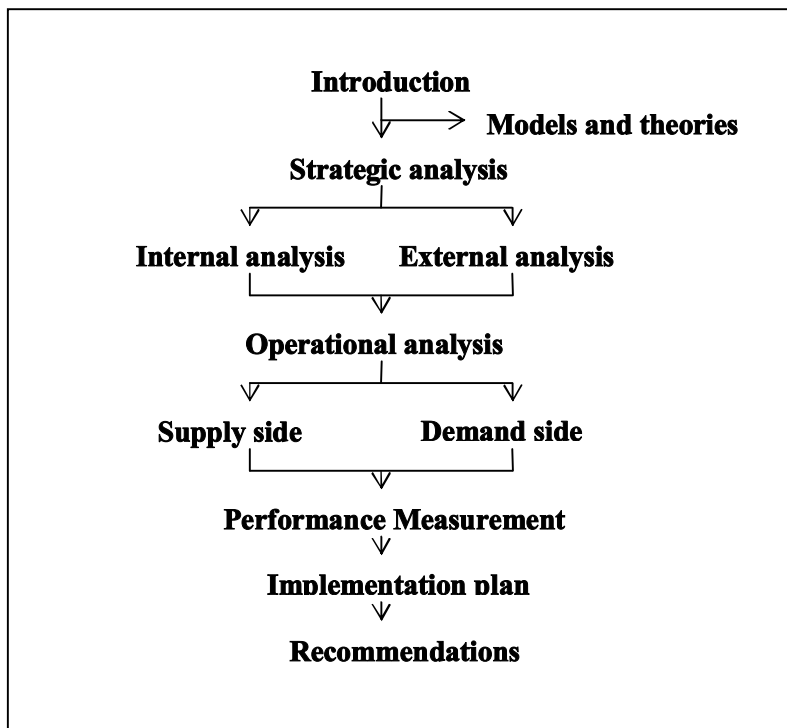


Figure 1 The structure of the research

2. Models and theories

Based on the problem formulation, a decision has been made on how to approach the research. This decision calls for a choice of which theoretical models should be used. This chapter presents a short description of the models and tools applied in this research.

2.1. Introduction

The models and theories determine the foundation of this thesis, which will apply to the whole problem formulation, research, and solution-finding procedures of this thesis.

As the activities in a company become more focused on a tightly defined set of tasks and there is more out-sourcing of materials and service, the importance of the links between all those operational “chains” becomes higher and higher. According to statistic, *at the demand side of the business it's being claimed that up to 25% of total costs can lie in the distribution chain which transport goods and services to customers.*². This brings out the increasing emphasis on supply chain management in a company.

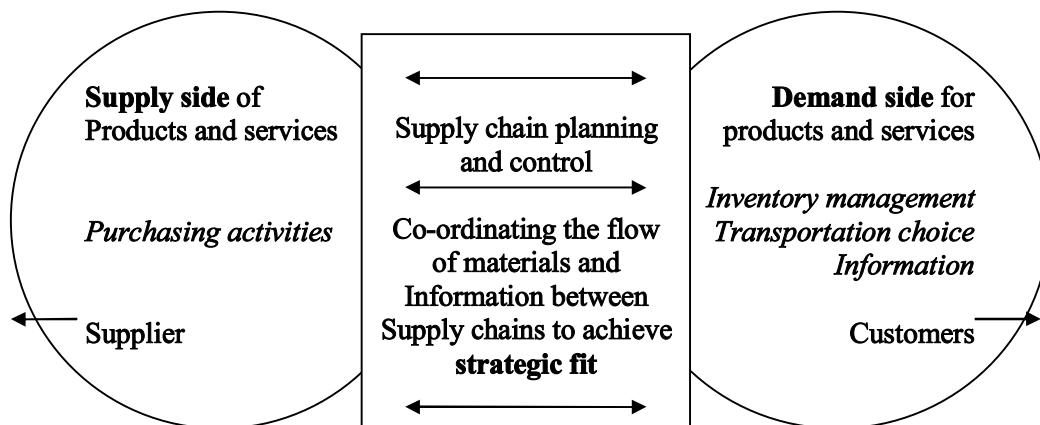


Figure 2 The supply chain network³

The definition of supply chain: “A supply chain is the set of entities that collectively manufactures a product and sells it to an endpoint.”⁴ The ultimate beginning point is where raw materials are being extracted and the end point would be where goods and services are being consumed, or perhaps even recycled. A successful supply chain management can add speed, dependability, flexibility, cost-saving and quality-improvement to the whole operation performance.

² [Operational management by Nigel Slack, etc. p. 510]

³ [Operational management by Nigel Slack, etc. p. 510]

⁴ [Stern et al, 2001, p.513]

As we can see from Figure 2, the supply chain network is divided into two parts: the supply side (upstream) and the demand side (downstream): The supply chain activities on the supply side mainly refer to the *purchasing activities*; and the demand side includes activities such as *inventory management, transportation choice and information*. These activities integrated with each other are the four main drivers of the performance of supply chain management in order to achieve strategic fit.

In the next part of the thesis, all the four drivers of the supply chain performance will be specified and examined in detail.

2.2. Strategic analysis

The strategic analysis contains the internal and external Strategic examination of the company, the purpose is to analyze whether the supply chain model fits the competitive strategy of the company and the environmental needs.

2.2.1. Internal analysis

The internal analysis is the first step to understand the logic of business operation in depth. The aspects of this analysis are the competitive strategy and organizational characteristics in the form of organizational structure, Resources and operation procedures, which will lead to the organizational Strengths and Weaknesses.

Research questions to be answered:

- What are the vision, mission, goals, and strategies of Huawei?
- What is the organizational structure and the responsibilities of Huawei supply chain?
- What are the strengths and weaknesses of the Huawei supply chain?

Strategy is the direction and scope of an organisation in the long term, which will achieve advantage in a changing environment through its configuration of resources and competences with the aim of fulfilling stakeholder expectations⁵. It can boil down to four layers: the mission, vision, goal and objectives, which become more concrete and quantifiable as it goes down to the lower layers.

The definition of *Mission* can be stated as the overriding purpose in line with the values or expectations of stakeholders. It can give the general answer to questions such as: what is the customer need, which markets can the company serve; and what kind of activities can add the value to whole business chain. The *vision* of a company is the desired future

⁵ [Johnson, Scholes & Whittington: Exploring corporate strategy (7th Ed.)]

state; the *goal* is a general statement of purpose and the *objective* is the quantification statement of the goal.⁶

There are different levels of strategy, the corporate-level strategy is the overall strategy which gives the direction of the development of the company, and each function of the company also has its own strategy which, if integrated well with the overall strategy, can deliver efficiently the strategic fit in terms of resources, processes and people.

A lack of strategic fit between the overall competitive and supply chain strategy can result in the supply chain taking actions that are not consistent with customer needs, and reduce supply chain profitability. Strategic fit forces all functions and stages in the supply chain to target the same goal, one that is consistent with customer needs. The key to strategic fit is ensuring that supply chain responsiveness is consistent with customer needs and implied demand uncertainty. To get to this point, a company should understand what is their customer need, how to serve them, and the implied demand uncertainty. Besides, the supply chain's capabilities in term of efficiency and responsiveness should also be perfectly understood.

2.2.2. Environmental analysis

The purpose of this part is to provide frameworks for understanding the environment of organizations' supply chain with the aim of helping to identify main environmental changes and ways of coping with complexity and uncertainty brought by these changes.

Research questions to be answered:

- What are the main environmental characteristics of the telecommunications market in Europe?
- What are the opportunities and threats from the European market?

The macro-environment consists of broad environmental factors that impact most organizations or sectors. In recent years, the scope of supply chain has been expanded a lot due to a number of changes in the manufacturing environment, including the rising costs of manufacturing, shortened product life cycles, and the globalization of market economies. Thus in this part, the "PESTEL" framework is used to identify the factors that influence the sector of supply chain in a whole.

PESTEL stands for Political, Economic, Social, Technical, Environment and Legislative, the six key drivers of change which is likely to affect the structure of an industry, sector or market. Although there will be many changes occurring in the macro-environment of most organizations or sectors it will be the combined effect of just some of these separate factors that will be so important, rather than all of the factors separately.⁷

⁶ [Johnson, Scholes & Whittington: Exploring corporate strategy (7th Ed.)]

⁷ [Johnson, Scholes & Whittington: Exploring corporate strategy (7th Ed.)]

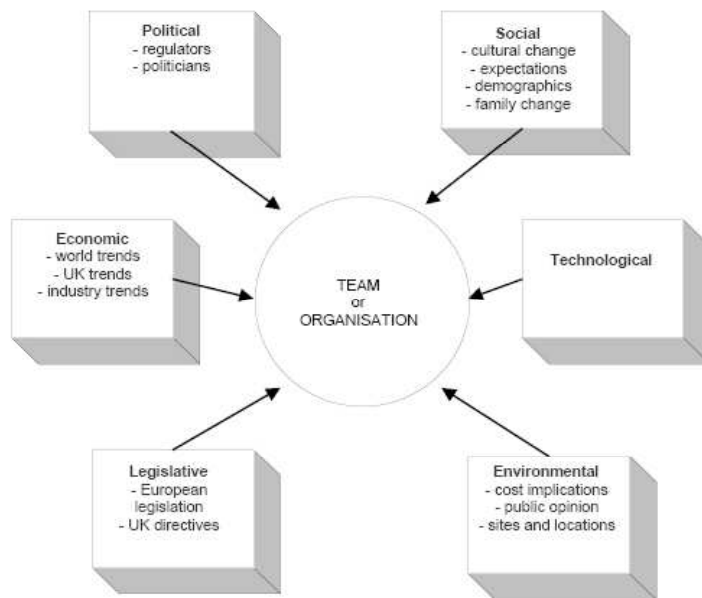


Figure 3 The PESTEL framework

The purpose of environmental analysis is to find out the strategic position of a company, one aspect of it is to identify the impact on external strategy, which addresses the environmental opportunities and threats on the organisation.

2.2.3. The strategic position of Huawei supply chain

From the internal analysis we can get the organizational Strengths and Weaknesses. And from the environmental analysis we can get the environmental opportunities and threats on the organization. Thus a SWOT framework is formed to state the strategic position of the supply chain.

SWOT analyses summarize the key issues from the business environment and the strategic capability of an organisation that are most likely to impact strategy development. The purpose of the SWOT analysis is to assess what Huawei supply chain do well and what they could do better as departments, and then determine the requirements for the supply chain development.

2.3. Operational analysis

In this section, the supply chain operation is analyzed in depth to understand the components of supply chain. Only on the basis of a full understanding of the supply chain,

the performance of Huawei international supply chain can be measured thoroughly. The research will be carried out the supply side and the demand side of the supply chain.

Research question to be answered:

- What is the operational situation of Huawei supply chain?

2.3.1. Supply side of the supply chain

Purchasing activities buy in materials and services from suppliers which will become the input of the production process. It provides a vital link between the operation itself and its suppliers thus an important component of supply chain. The purchasing staff has to understand in detail the requirements of all the processes within the operation it serves and also the capabilities of the suppliers who could potentially provide products and services for the operation.

There are five objectives of the purchasing function, also known as “the five rights of purchasing”⁸:

- At the right price
- For delivery at the right time
- Of goods and services of the right quality
- In the right quantity
- From the right source

Research question to be answered:

- What are current purchasing activities in Huawei supply chain?

2.3.2. Demand side of the supply chain

At the demand side of the organization products and services need to be ‘communicated’ or moved to the customers.

- **Inventory:**

Inventory is all raw materials, work in process, and finished goods within a supply chain. The function is to provide an intermediate stage in the distribution system so that the manufacturer does not have to deal with every single customer, from the customers’ point of view it also means that they do not have to deal with a whole range of suppliers.

⁸ [Baily, p., Farmer, D., Jessop, D. and Jone, D., *Purchasing principles and management*, Pitman, 1994]

The decision can dramatically alter the supply chain's efficiency and responsiveness. Reduced inventory can add efficiency to the supply chain, but at the risk of lowering customer satisfaction. Increased inventory can add the level of product availability but increase the cost. Thus the purpose of inventory decision is to decrease inventory without increasing cost or hurting the level of customer satisfaction.

- **Delivery:**

Delivery refers to the movement of product from one location to another as it makes its way from the beginning of a supply chain to the customer's hands. It is a big consideration of the supply chain managers; they not only have to decide which transport models are the most cost-efficient, but also have to consider the time concern.

Usually there are five models of Delivery to choose from: road, rail, water, air and pipeline. Each has its own strength and weakness, but not all transport will be suitable for all types of products. The choice can be set with reference to the relative importance of the following criteria:

- Transportation speed
- Transportation costs
- Route flexibility

The design of a Delivery network affects the performance of a supply chain; a well-designed Delivery network allows a supply chain to achieve the desired degree of responsiveness at a low cost.

Besides, the delivery design is closely linked to the inventory decisions, since the best choice of model is often found by trading-off the cost of using the particular model of transport with the indirect cost of inventory associated with that model. In this part of the thesis, a variety of design options is discussed and compared to find out which ones are suitable for Huawei supply chain.

Research questions to be answered:

- What are current inventory activities in Huawei supply chain?
- What are current transportation activities in Huawei supply chain?

2.4. Measurement of supply chain performance

After the strategic and operational analysis of Huawei supply chain, we move to the part of measurement. Supply chain managers need a comprehensive and consolidated view of their supply chain performance in order to make intelligent decisions.

The Balanced Scorecard (BSC for short) is a measurement and management system that enables organizations to clarify their vision and strategy and translate them into operational action.⁹ The BSC will be applied in this research to measure the current performance level of Huawei supply chain, based on the customer-oriented competitive strategy of Huawei, it's supply chain operation will be viewed from four perspectives: the Business Process Perspective, the Customer Perspective, the Financial Perspective as well as the Learning & Growth Perspective (as shown in figure 4 below). Under each perspective, a set (four or five) of most comprehensive Key Performance Indicators will be developed to measure the performance of the current supply chain system. Then analyze the score of each KPI based on data collected from the daily supply chain operation, so as to get the final score of the whole supply chain performance.

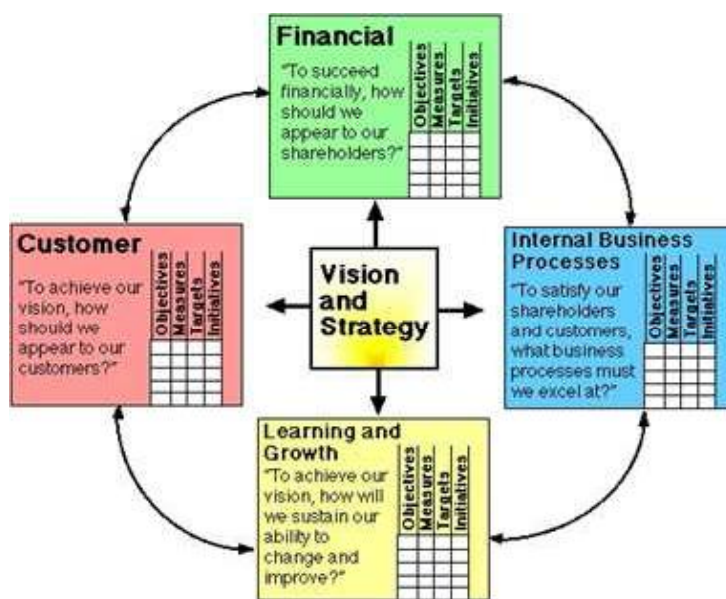


Figure 4 the structure of the Balanced Scorecard¹⁰

The reason for choosing BSC to measure the supply chain performance in this research is: First of all, the BSC provides not only an analysis of all supply chain activities: procurement, warehousing and transportation on operation point of view, but also aligns these activities to the other aspects of Huawei, the financial situation, customer satisfaction as well as the learning and growth, therefore to provide a comprehensive vision of supply chain performance; second, the BSC increase focus on strategy, because it can aligns business activities of day-to-day basis to the vision and strategy of the organization. Third, the BSC improves organizational performance by measuring what really matters; it can focus on the key metrics that have real meaning to Huawei supply chain. The BSC approach helps to keep measures aligned with objectives. Forth, the BSC focus on the drivers of future performance, therefore lead to the continuous development.

⁹ <http://www.balancedscorecard.org/Home/tabid/36/Default.aspx>
¹⁰ <http://www.balancedscorecard.org/Home/tabid/36/Default.aspx>

The performance indicators can be either qualitative or quantitative. Qualitative performance indicators are those measures for which there is no single direct numerical measurement, although some aspects of them may be quantified. Quantitative performance indicators are those measures that may be directly described numerically.

The following research question to be answered in this part:

- How does Huawei's international supply chain operate and what is its performance?
- What are the KPIs of measuring the performance of supply chain activities?

2.5. *Improvements and implementation*

After the situation of Huawei's supply chain performance is examined and main factors which influence the supply chain performance are looked into, the purpose of this part is to select the key opportunities and develop possible improvements, and make a feasible plan for the implementation of these improvements.

The following research questions are to be answered in this part:

- Where are promising opportunities and improvements?
- What is the plan for implementing improvements?

2.6. *Summary on models and theories*

In this section, a short summary of the models and theories applied in this thesis is presented.

PESTEL framework is used in the “environmental analysis” to identify the factors from political, social, economic, legislative, environmental and technological side of Macro environment which influences the supply chain decision making; SWOT analysis is applied to state the strategic position of supply chain by combining the internal and external analysis of Huawei supply chain; The “Five purchase principle” is applied as a standard to evaluate the purchasing activities at the supply side of supply chain; The Balanced Scorecard is applied in the measurement to evaluate, from both strategic and operational point of view the overall performance of the Huawei supply chain.

3. Strategic analysis

In this chapter, the internal strategic and environmental strategic analysis will be carried out to find out the strengths, weaknesses, opportunities and threats around the Huawei supply chain.

3.1. Internal analysis

The internal analysis focuses on the competences and resources of Huawei supply chain, which are under its control. The main analysis directions are the Huawei supply chain strategy, the organizational structure and scope of supply chain, and the processes of supply chain.

3.1.1. Strategic fit

Through the website of Huawei Technologies can we find the Vision, Mission and Strategy of this company, the content of which are listed in the below chart:

VISION: To enrich life through communication.

MISSION: To focus on our customers market challenges and needs by providing excellent communications network solutions and services in order to consistently create maximum value for customers.

STRATEGY: Customer Focus Strategy

- Serving our customers is the only reason Huawei exists; Customer demand is the fundamental driving force of our development.
- High quality, excellent service, low operating costs, and giving top priority to meeting customer requirements to enhance their competitiveness and profitability.
- Continuously performing management transformation to realize efficient process-based organization operation for ensuring high quality end-to-end delivery.
- Developing with our peers in the industry as both competitors and partners to jointly create a favorable environment and share the benefits of the value chain.

The vision, mission and strategy of Huawei Technology¹¹

Strategic fit means matching the mission and strategies of an organization to its internal structure and its external environment. In terms of strategic fit of supply chain it refers to

¹¹ http://www.huawei.com/corporate_information/vision_mission.do

consistency between the customer priorities that the competitive strategy is designed to satisfy and the supply chain capabilities that the supply chain strategy aims to build.¹² So in order to understand Huawei customers' need, it is necessary to view their supply chain capabilities to see if the strategic fit is achieved or not.

Understand the customer need: The Benelux customers of Huawei have very high requirements for them, these three countries have been among the most advanced in Europe in the use and development of telecommunications services. With small populations sophisticated in the use of advanced technologies, these countries also benefit from an infusion of people and capital investment from their larger neighbors, as well as the infrastructural developments arising from the several EU administrative centers established in the region. They require specifically-designed products with high-quantity, advanced technology and environment considered. The response time those customers are willing to tolerate is short, the service level required is high and the price is kept low because of the fierce competition in telecommunications, mobile and broadband market here. According to a metric of implied demand uncertainty¹³, within the range from certain demand, which means the customers demand is low and stable, to the uncertain demand, which means the customers demand is high and unstable, Huawei's customers are more to the considerably uncertain demand side.

Since the Benelux market is characterized as high implied demand uncertainty, the competitive strategy for Huawei is, and should be, built as a customer-focused competitive strategy¹⁴, which means the development and performance of all components of Huawei's value chain, including the supply chain, should be driven by customer's requirements.

Supply chain strategy: Chains have different characteristics like customer needs. Along the spectrum of responsiveness and cost-efficiency¹⁵, they can be categorized differently according to their own location between two extremes.

Supply chains range from those that focus on being responsive to those that focus on efficiency with a goal of producing and supplying at the lowest possible cost. Benelux customers of Huawei have high demand, supply chain have to respond very quickly to a wide range of different order and orders changes within a short lead time, with the high service level (on-site installation), as well as highly innovative products. So the Huawei supply chain is considered as a responsive supply chain, but at the same time, increasing the responsiveness of supply chain also means higher cost, therefore efficiency is reduced. Thus the aim of Huawei supply chain is to build supply chain capabilities to respond quickly to customer demand while keeping the cost down.

Achieving strategic fit: as shown in the figure 5 below, with implied uncertainty increasing as we move along the horizontal axis and responsiveness increasing along the

¹² http://www.12manage.com/description_strategic_fit.html

¹³ implied demand uncertainty: <http://www.bibhor.com.np/lecture/Detail.php?AID=29>

¹⁴ customer-focused competitive strategy: <http://www.bibhor.com.np/lecture/Detail.php?AID=29>

¹⁵ cost-efficiency: <http://www.bibhor.com.np/lecture/Detail.php?AID=29>

vertical axis. A point in it represents a combination of implied demand uncertainty and supply chain responsiveness, the question is which kind of combinations of implied demand, uncertainty and supply chain responsiveness result in strategic fit.

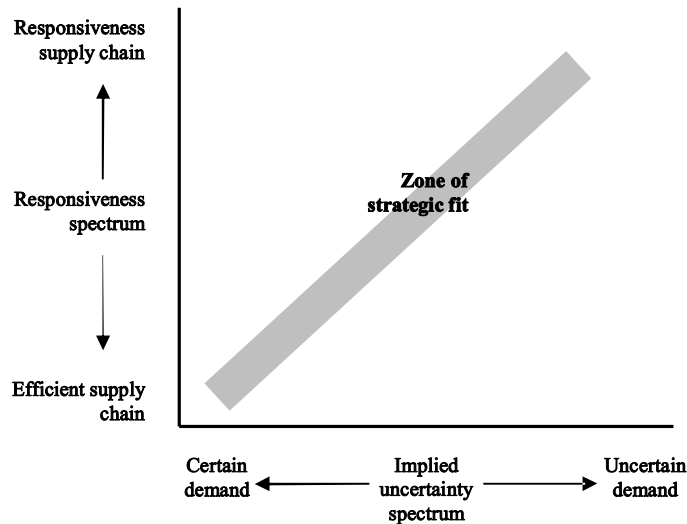


Figure 5 Zone of strategic Fit¹⁶

For Huawei, the high demand of their Benelux customers is characterized as having demand uncertainty which leads to the customer-oriented competitive strategy for Huawei. Huawei has the option of designing an efficient or responsive supply chain, an efficient supply chain may use slow, inexpensive modes of transportation and economies of scale in production, it will lead to cost-saving, but it may also have difficulty supporting customer satisfaction. Therefore a responsive supply chain strategy is best suited to meet the needs of Huawei's Benelux customers. And in this way, a strategic fit is achieved by both company competitive strategy and supply chain strategies aiming at the same goal of customer satisfaction.

Supply chain strategy leads the way for its activities, but only as accompanied by corresponding allocation of responsibility and resources, it can perform to the best. So in the next section, the organizational structure and supply chain process of the Huawei supply chain is discussed.

¹⁶ Nigel Slack, Stuart Chambers, Christine Harland, Alan Harrison, Robert Johnston, *operational management*, Pitman publishing

3.1.2. Huawei's supply chain

An appropriately structured supply chain department can assure the proper processes and resources to be executed and allocated in the supply chain to help to achieve the supply chain strategy as well as the competitive strategy; it is also the foundation of a successful supply chain performance. In this section, the structure of supply chain will be introduced and its processes and the responsibility are discussed step by step through a process view of a supply chain.

Huawei has been dedicated to establish an integrated supply platform build on the solution of IBM supply chain plan and i2 supply chain solution which is customer-oriented, fast to respond and able to meet various market demands. These solutions contain a strong IT support such as the application of ERP and APS system can secure the smooth operation flow. It:

- Constructs and maintains the procurement competitive edge through establishing good partnership with suppliers;
- Improves the manufacturing capability and implements the whole-process logistics management by integrating internal operations;
- Builds the market competitive edge via supply chain integration

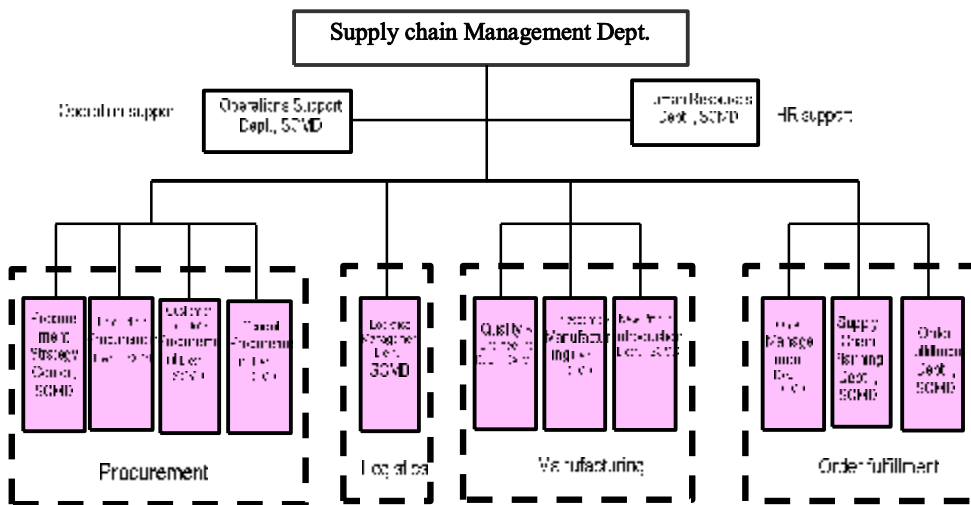


Figure 6 Organizational Structure of Huawei Supply Chain¹⁷

As shown in figure 6 above, the Huawei supply chain includes departments such as procurement, manufacturing, order fulfillment, logistics and human resources, to provides an end-to-end service of connecting all activities of the whole company, starting from the purchase of the raw materials and ending with the delivery of the final products to the end user or products components to the customers site for final installation. This flat structure across its supply chain components can provide efficiency, reliability and flexibility to the whole operation flow. Therefore it enables the supply chain to quickly

¹⁷ This figure is taken from the organization chart of Huawei Technologies.

respond to customer's needs and achieve customer satisfaction. And in order to overcome the disadvantage of less familiarity of local business environment, the Benelux human resource department has a "localization" policy with the purpose to hire more local talents who know more about the local business. One point to be noticed is that the installation team on site is part of the project department, not part of supply chain. Therefore if goods need to be installed, customers only contact with the installation team instead of supply chain. The delivery orders are issued by the installation team instead of customer; this often leads to internal misunderstanding.

Huawei Benelux representative office is an oversea branch set up in the Netherlands with the intention to stay closely to its Benelux customers to satisfy their requirements, so it can have close relationships with customers and other suppliers' networks. Therefore it enables the supply chain to quickly respond to customer needs and achieve customer satisfaction.

- **Organization structure**

After learning the organizational structure of Huawei supply chain, the next step is to analyze the model used to build their supply chain process and responsibilities. The appropriate design of supply chain process depends on both the customer needs and the roles of the stages involved in fulfilling those needs. Supply chain activities begin with a customer order and end when a satisfied customer has paid for their purchase. Huawei supply chain is the process of build to order, this means the manufacturing is initiated directly by a customer order instead of going through external distributors and retailers.

The model of Huawei supply chain processes is based on an integrated supply chain plan of IBM and i2 supply chain management solution based on the ERP and APS systems. This model provides a base of the internal logic of Huawei supply chain activities and responsibilities, the work process, and how these activities are integrated together. It also provide a globally centralized platform based on the concept "Customer-oriented, partnership and information-shared, and process-oriented" and by referring to the Supply Chain Operations Reference-model (SCOR for short)¹⁸. The aim of this supply chain process model is to construct a highly-efficient, mutually beneficial, and open supply chain by utilizing advanced information technologies and fully cooperating with customers and suppliers.

¹⁸ http://www.supply-chain.org/cs/root/scor_tools_resources/scor_model/scor_model

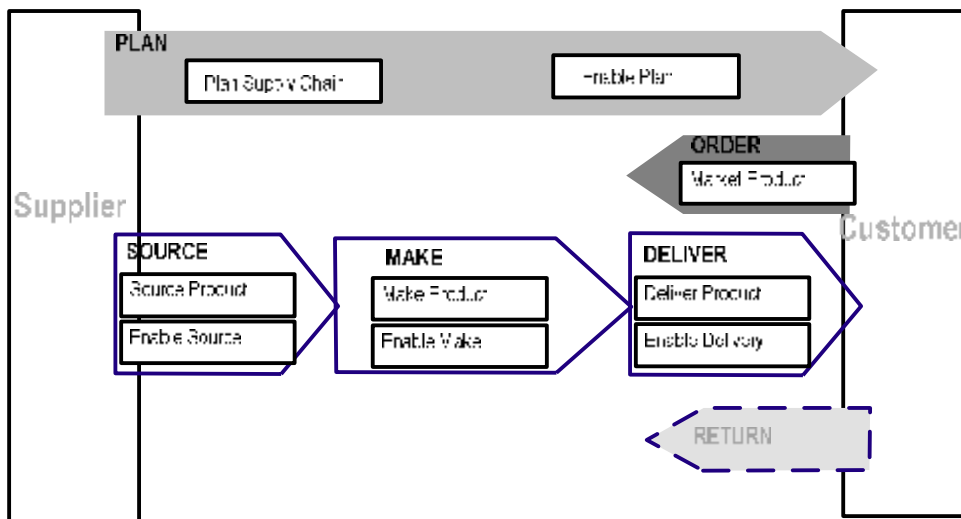


Figure 7 Supply Chain Management Model¹⁹

As shown in the supply chain management model at figure 7, the customers purchasing order sent to Huawei Benelux triggers the whole supply chain processes, which contains procurement (source), manufacturing (make) and delivery (from Shen zhen or Germany Assembling Center to Benelux warehouse) and the local delivery (from local warehouse to customers or installation site).

In order to further explain the process of Huawei supply chain, the cycle view applies to break down supply chain into three process cycles: Customer order cycle, Manufacturing and Distribution cycle and Procurement cycle. Each cycle occurs at the interface between two successive stages of the supply chain. The cycle view of the supply chain clearly specifies the roles and responsibilities of each component of Huawei supply chain, it provides the basis of when setting up information systems to support supply chain operations. Figure 8 describes the cycle view.

¹⁹ This figure is taken from the organization chart of Huawei Technologies.

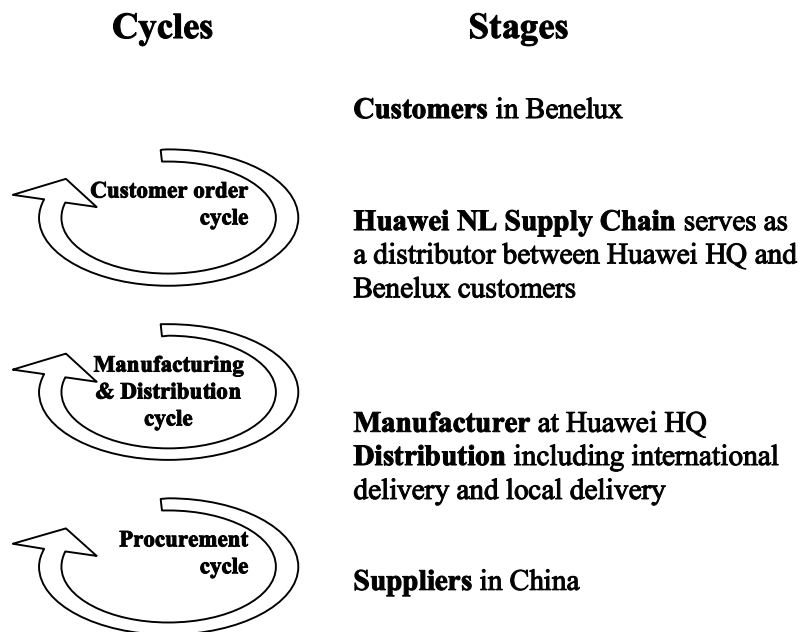


Figure 8 Supply chain process cycles of Huawei ²⁰

- Customer order cycle

This cycle occurs at the customer/manufacturing interface and includes receiving and filling the customer's order. In Huawei supply chain, this order cycle includes, as shown in Figure 9, the process from signing contract with the customer, receiving and processing the customer order to complete the customer order and provide after-sales service such as installation.

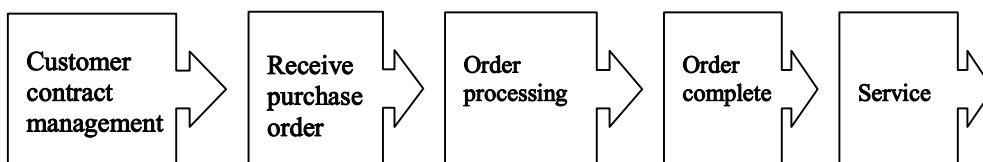


Figure 9 Huawei customer order cycle

- Manufacturing and Distribution cycle

This cycle typically occurs at the distribution and manufacturer/procurement interface, it including two main activities: manufacturing and distribution.

Manufacturing activities take place in the Huawei headquarter in China. It is triggered by a direct customer order from Netherlands, or by the forecast of customers demand by

²⁰ Sunil Chopra, Peter Meindl, *Supply chain management, strategy, planning, and operation*, Prentice Hall, Inc., 2001

Huawei NL. Then orders are allocated to a production plan in order to maximize the proportion of orders filled on time while keeping costs down, the manufacturing process then takes place according to the production schedule.

Distribution activities have two parts, during the international delivery, products are shipped from factory in headquarter to Huawei NL. After products arrives in the Netherlands, they are either sent directly to customer or stored in the local warehouses for further delivery notice, the inventory records are updated, other processes related to storage and fund transfers also take place.

- Procurement cycle

This cycle occurs at the manufacturer/supplier interface and includes all processes necessary to ensure that materials are available for manufacturing to occur according to schedule. During this cycle, the manufacturer orders components from suppliers that replenish the component inventories.

The strategy of Huawei procurement is Centralized certification, dispersed procurement. Which means that on one hand, the organizational structure, process and IT system help to achieve the objectives of centralized procurement strategy, supplier selection and basic supplier management; for supplier selection and procurement execution, Huawei has clearly defined its authorization as follows: only the Procurement department can make an outward commitment on behalf of the company. On the other hand, the dispersed procurement helps to reach the aims of flexible decision making, quick response to the market and meeting local demands. The two sides join to constitute an operation mode which makes procurement efficient and simple.

3.1.3. Conclusion on internal analysis

The competitive strategy of Huawei is built as a customer-focused strategy because of the high implied demand uncertainty of her customers; and its supply chain applies a responsive supply chain which is able to meet the high requirements from customers. The strategic fit between the company strategy and its supply chain strategy is important to the development of the supply chain. This alignment of “customer focus” can lead to the same goal of customer satisfaction and appropriate distribution of company resources.

An integrated supply platform which is built on the solution of IBM supply chain plan and i2 supply chain solution, and the application of ERP and APS system in Huawei supply chain, aims to customer-orientation, fast responsibility and ability to meet various market demands. The strong IT support can secure the smooth operation flow.

The clear responsibilities separation across organization can provide efficiency, reliability and flexibility to the whole operation flow, so supply chain can quickly response to customer need. But at the same time it also leads to the disconnection of supply chain and

project department, sometimes misleading the internal inefficiency, because during installation the on-site project team can change customer requirements and place orders without the consideration of supply chain.

Huawei Benelux representative office as an oversea branch set up in the Netherlands enable Huawei to have closer relationships with her Benelux customers and therefore enables the supply chain to quickly respond to customer needs and achieve customer satisfaction.

Besides, the Benelux Human resource department provides on-the-job training to all employees for future growth and development. They also have a program of localization, which brings in more Benelux employees who are more familiar with the local market. However, high turnover of employees leads to inconsistency and work gaps and the lack of coherent training.

3.2. Environmental analysis

In this section, the main environmental factors and changes which will influence the supply chain performance and its ways of coping with complexity and uncertainty will be discussed. The purpose of environmental analysis is to find out the strategic position of a company. One aspect of it is to identify the impact on strategy of the external environment, which addresses the environmental opportunities and threats on the organisation.

The macro-environment consists of broad environmental factors that impact most of organization or sectors. In recent years, the scope of supply chain has expanded a lot due to a number of changes from the related external environment, including the rising costs of manufacturing, shortened product life cycles, and the globalization of market economies, etc. Thus in this part, the “PESTEL” framework, which stands for Political, Economic, Social, Technical, Environment and Legislative, the key drivers of change that are likely to affect the structure of a market, are used to identify the factors that influence the sector of supply chain.

3.2.1. “PESTEL” analysis of external environment

- Political factors

The activities and policies of governments have a big influence on the environment of supply chain management. In the European market the foundation of the single internal market in 1993 resulted in the abolition of controls at fiscal frontiers. The wide spread Euro counties made the currency exchange risk become smaller, in this way, the threat to supply chain cost-saving efficiency caused by this risk also became smaller.

On the customs side, all 27 Customs administrations of the EU act as though they are one, all import and export duties on trade is abolished between member countries, and a common tariff is applied to external countries. This encourages smooth flow of shipments between Benelux countries as well as other European countries, reduces the transit time and saves delivery expense.

On the taxation side, member states are free to choose the tax systems that they consider most appropriate and according to their preferences. Especially in the field of the Value Added Tax (VAT for short), they are different from country to country, which causes a lot of difficulties on the free flow of capital, human resources and service, thus preventing companies from operating freely across borders between member countries.

Globalization has been further encouraged by particular host governments that actively seek to encourage global operators to invest in their countries. The Netherlands government has instituted a system that provides for the deferment of VAT at the time of import. Instead of paying VAT when the goods are imported into free circulation within the EU, the payment can be deferred to a periodic VAT return. Under this system, the VAT at import should be declared but the amount can be deducted on the same return. The bottom line is that there is no actual payment of VAT at import, so that Huawei Benelux supply chain can realize cash-flow and interest earning benefits.

- Economic factors:

There have been many changes in the worldwide market and economic environment because of the increasing globalization, including rising costs of manufacturing and R&D; as well as the shortened product life cycles. Increases in global sourcing and inventory holding charge, both have raised the cost of the supply chain, thus the supply chain management has to consider not only the responsiveness but also the efficiency of the supply chain if they want to earn profit. Besides this, the product life cycles for telecommunications products is even more shortened, which asks for shorter transit time, therefore put more requirements on the delivery abilities and supply chain responsiveness. As we known from last chapters, the customer demand in Benelux is characterized as high implied demand uncertainty. Customers require specifically-designed products with high-quantity, advanced technology and environment considered, the response time those customers are willing to tolerate is short, the service level required is high and the price is kept low because of the fierce competition in the telecommunications, mobile and broadband market in European. All this leaves limited market share to Huawei, especially as she is a foreign brand, not yet well-know to most of European customers compared to competitors such as Siemens, Ericsson and Alcatel.

Globalization also brings more fierce competition around the world, if a company is competing globally; it also tends to place globalization pressures on its competitors, especially if customers are also operating on a global basis. The competition shows not only on the marketing side, but also on the side of supply chain management. The rapid pace of economic Globalization caused the establishment of many overseas branches, because supply chains need to follow customers abroad, these cause extending of supply

chains. Every overseas branch has their own profit center and supply chain goals, which may come into conflict with overall interest of the company. Besides, communications between headquarter and branches and between branches may not perform very well due to the long distance and little familiarity. All these factors in combination add more complexity and limit the responsiveness of supply chain. Thus managing the supply chain ahead of its competitors will give the company more competitive advantages.

- Legal factors:

Corporate income tax: Recent reforms to the Dutch corporate income tax system have improved the investment climate for foreign companies by offering additional tax relief for companies doing business here. As of January 1, 2007, the corporate income tax rate is 25.5% which is lower than the average of the EU-25 (25.8%) and far below the average of the EU-15 (29.5%). The dividend tax rate is also reduced for all firms, down from 25% to 15%. This new tax system provides good opportunities for cost-saving to foreign companies as well as their supply chain departments.

Human capital: When coming to the decision of setting up a branch in the Netherlands, a company has to consider the composition of its human resources, for supply chain this is also a part of investment expense. The HR can choose from hiring local employees or using ex-pats. Before one alternative is chosen, the legal rules about these two methods have to be examined first. For the ex-pat route, the cost is high, under both Dutch and Chinese laws, besides the salary, the company has to pay for relocation, home leave tickets, cost-of-living allowances, tax gross ups and the like. And there is also a time limit, the ex-pat can not stay abroad for as long as they want, it depends on the visa issued, the assignments can vary in length from business trips lasting less than 3 months to permanent transfers lasting over 5 years. To use local employees also have considerations of high cost²¹, because employee rights are well protected under Dutch law, it is difficult for an employer to terminate an employment contract in the Netherlands. An employer must obtain approval from the Dutch Center for Work and Income (CWI) before terminating an indefinite employment contract. Salary is also well-defined under the Dutch labor law. The salary includes mandatory benefits that an employer must pay by law or collective agreements like social security.

- Environmental factors:

In recent years, there have been increasing considerations towards environmental protection in European countries as well as the whole world. The view of supply-chain design and improvement as a means of promoting sustainable development are not new. Reverse logistics²² is a related tool to reduce environmental impacts through recycling of packaging and products. Planning a product's prolonged life span after normal use, also

²¹ According to a survey by Mercer Human Resource Consulting (April 2005), the average employment costs in the Netherlands are € 34,725 (full-time male employee including pay for vacation and public holidays) covering € 29,354 pay, € 3,023 for social security and € 2,348 for voluntary benefits.

²² Council of Logistics Management, 1993

requires comprehending possible uses for used material²³; and the approval in 1996 of the first four of the International Organization for Standardization's (ISO) 14000 standards for environmental management systems can be expected to add significant further impetus to internal and extended supply-chain environmental stewardship.

These environmental requirements on company and supply chain imply more tasks to be done and more cost to be paid during manufacturing and procurement processes. For example: the supply chain operation is required to provide an environmental report as well as identify which suppliers' products and services have the highest environmental impacts. Also the supply chain has the responsibility to review any environmental reports their suppliers produce. At the same time this also benefits companies and their supply chain performance in several areas: in helping customers to improve their performance and regulatory compliance; in reducing risk and strategic vulnerabilities internally and for their customers; in improving the atmosphere between themselves and regulators and possibly reducing compliance costs; and in improving their reputation and reducing transactions costs in dealing with local communities, environmental groups, and other external stakeholders.

- Technological factors:

Rapid market growth for supply chain planning tools such as ERP, SCOR, Slotting, etc, both simplify the supply chain and help optimize the many costs associated with a complex supply chain.

Mastering the supply chain tools which fit the actual operation process can greatly help the supply chain to eliminate communication difficulties between different parts of supply chain, and provide every part of supply chain a comprehensive view of the process to avoid individual interest consideration. In this way, the overall cost can be reduced, efficiency can be promoted thus the performance of the supply chain will be improved.

Another aspect is the development of ways of communication, and distribution channels brought by the trend of market globalization. Especially when the Netherlands is the logistics center of Europe, its excellent and well-developed logistics industry provide a wide range of choice for experienced logistic service providers and extensive transport infrastructure with fast connections to excellent sea and airport facilities. This increasing transfer of marketing has also made the supply chain structure and management principles more transferable across geographical locations.

3.2.2. Conclusion on external analysis

The "PESTEL" framework is applied to analysis the changes on Political, Economic, Social, Technical, Environment and Legislative side of business environment.

²³ Willums and Goluke 1992

On the political side, the expansion of European single market, the new fiscal policy, customs policy, as well as Netherlands VAT deferment licenses policy, all encourages smooth cash and goods flow, therefore benefit supply chain operation on delivery efficiency and effectiveness. On the economic side, shortened product life cycles; increases in global sourcing and inventory holding charge, both have raised the cost of the supply chain and make supply chain competition fiercer. On the legal side, the reduction of Dutch corporate income tax relief the tax burden for companies doing business here, which is an opportunity. But on the human capital side, Huawei and its supply chain have to consider the human resource combination of ex-pats and local employees, since under the Dutch employee laws, both have advantages and disadvantage on work efficiency and human resource cost. On the environmental side, increasing considerations towards environmental protection put new requirements on supply chain operation such as reverse logistics, recyclable packing materials. This implies more tasks to be done and more cost to be paid during manufacturing and procurement processes of supply chain operation. On the technological side, rapid market growth for supply chain planning tools such as ERP, SCOR, Slotting, etc, both simplifies the supply chain and helps optimize the many costs associated with a complex supply chain.

3.3. SWOT analysis and consequences

A SWOT analysis in this thesis is used to summarize the key issues from the business environment around Huawei supply chain, and the strategic capability of this department that is most likely to impact on strategy development of Huawei as a whole.

SWOT analysis examines the strengths, weaknesses, opportunities, and threats of Huawei supply chain relative to those of competitors. The strengths and weaknesses are competences and resources of the supply chain, and the structure and procedures that are under its control. The strengths and weaknesses are collected through the internal strategic analysis of Huawei supply chain in section 3.1 and the opportunities and threats which the supply chain department faces from trends and changes in its environment not under their control or influenced by their actions. The opportunities and threats are collected through environmental analysis in section 3.2.

Opportunities	Threats
<ul style="list-style-type: none"> • Close to Benelux customers and with clear understanding of what they need • The pace of the European single market encourages smooth cash and goods flow, therefore benefits supply chain operation 	<ul style="list-style-type: none"> • Competitive business environment and many local competitors • The brand of Huawei has not generated sufficient popularity in the European market

<p>on delivery efficiency and effectiveness</p> <ul style="list-style-type: none"> • Government encouraging foreign trade, for example, the beneficial VAT deferment license policy, add to supply chain efficiency • Reduced corporate tax adds profitability • Advanced supply chain planning tools are easy to obtain and apply • Netherlands is the logistic center of Europe and the Internationally-oriented business community in the EU • Excellent and well-developed logistics industry provides a wide range of experienced logistic service providers and extensive transport infrastructure 	<ul style="list-style-type: none"> • shortened product life cycles, increases in global sourcing and inventory holding charge raise the cost of the supply chain and make supply chain competition more fierce • Purchasing power of customers is strong, customers have many requirements • High cost on Human capital on both ex-pat and local employee • Increasing consideration of environmental protection asks for more responsibilities and expenses for supply chain
<p style="text-align: center;">Strengths</p> <ul style="list-style-type: none"> • The strategic fit between supply chain strategy and Huawei overall competitive strategy leading to the same goal of serving customers better • Strong IT support • rational and clear responsibilities between supply chain processes • local branches have close relationships to customers, suppliers networks • employee know-how and competence • on-the-job training program encourage learning and growth 	<p style="text-align: center;">Weaknesses</p> <ul style="list-style-type: none"> • The installation team on site is not part of supply chain, thus the responsibilities and the cost is not clear • Indirect communication with the customers. (Organizational structure) • High turnover of employees and lack of coherent training to the new employees in oversea branches • Less familiarity with the local business environment is a disadvantage compared to local competitors

Figure 10 The SWOT matrix of Huawei supply chain

3.4. Conclusion on strategic analysis

From the result of the SWOT analysis, we can combine the opportunities, threats, strengths and weaknesses into SO, ST, WO, and WT in order to have a more specific understanding of the current situation of Huawei supply chain from a strategic point of view, and find out the possible that strategies should be applied in Huawei supply chain.

- **Strength and Opportunity**

The combination of Strengths and Opportunities is to use a Huawei supply chain's internal strengths to take advantage of external trend and opportunities.

In order to manage and stimulate the complex and changing international supply chain business and reduce cost, Huawei chose to build its supply chain operation on a strong IT supporting system, such as ERP and APS system and the i2 SCM solution. From the external technological side, the fast development of supply chain IT tools offers Huawei many choices and room to update its supply chain tools to apply them better in its business operation.

The set-up of Benelux branches makes Huawei supply chain have a closer relationship and better communication with her customers. This is of mutual benefit, Huawei supply chain can better understand her customers' requirements and therefore offer better services than local competitors. And local existing and potential customers can also understand more about Huawei products and supply chain service. At the same time, the politic environment is beneficial for the business to grow, the single market encourages smooth cash and goods flow. The government encourage foreign trade, and from business environment, Netherlands as the logistics center of Europe, has an excellent and well-developed logistics industry, can provide a wide range of choice for experienced logistic service providers and extensive transport infrastructure, thus Huawei supply chain can take advantage of these policies to expand business and better serve their customer.

The Benelux human resource department encourages "localization" which attracts more local talents who are familiar with the local business environment and policy, and they also provide many on-job training program to encourage learning and growth. At the same time, the developed industry of logistics can provide many experts with knowledge and experiences.

- **Strength and Threat**

Strength and Threat analysis uses a Huawei supply chain's strengths to avoid or reduce the impact of its external threats.

The Benelux customers of Huawei have high requirements on both product quality and delivery service, and compared to many competitors like Ericsson, Alcatel and Siemens in the European market, the brand of Huawei hasn't generated enough popularity in Europe. Therefore the business environment is very challenging for Huawei supply chain. Inside Huawei, however, the supply chain strategy is in line with the company competitive strategy, which is to focus on customer satisfaction, so Huawei supply chain

can work in coordination with other departments and can make the maximum use of the company resources to provide better delivery service to reach customer satisfaction.

Another threat is that telecommunication products has very short product life cycles. Increases in global sourcing and inventory holding charge raised the cost of the supply chain and make supply chain competition more fierce. Huawei supply chain has invested in many aspects such as an advanced planning and operational system with strong IT support, an end to end supply chain solution, and employee competence to build its capabilities to respond quickly to customer demand while keeping the cost down.

- **Weakness and Opportunity**

When opportunities exist in the business environment, but Huawei supply chain's has internal weaknesses that prevent it from exploiting those opportunities, that is where the Weakness and Opportunities analysis is needed to improve on its internal weaknesses by taking advantage of external opportunities.

The on-site installation team is the group that stays closest to the customer and understands customer needs, but due to the organizational structure, they are in different department than supply chain and their knowledge can't be shared with supply chain, causing some misunderstanding internally. Since the Benelux supply chain is located in Netherlands, they have the chances to communicate more directly with customers at present, and the IT platform of supply chain should promote better ways of communication with other departments.

High turnover of employees will lead to a disconnect of business and missing company knowledge, therefore Huawei can't fully enjoy the experience and knowledge brought by the local logistic experts, so how to hold employees is a main concern for the future growth and development of Huawei supply chain.

Compared to her Benelux competitors, Huawei is a foreign company that just started business few years ago. Therefore it has the disadvantage of less familiarity with the local business environment, Huawei may not be aware of, or fully make use of the local beneficial policies that apply to the business such as government policy, tax policy and custom policy.

- **Weakness and Threat**

Weakness and threat lead to the precarious position of Huawei supply chain and which defensive strategies should apply to reduce internal weakness and avoid environmental threat.

High cost of Human capital on both ex-pat and local employees in Europe add to the total cost of Huawei supply chain operation, while at the same time, the high turnover rate of employees fluctuates the business operation at supply chain. They have to invest continuously in hiring and training new employees. Therefore Huawei should look inside to find out the reason leading to the high turnover rate and improve on it.

4. Operational analysis

After understanding the factors that strategically influence supply chain performance as a whole, in this chapter we begin to research the operational factors inside the supply chain processes. The supply chain works as a bridge connecting the external supplier and customers to its internal business, the process at supply side mainly include procurement activities; and the processes at demand side refers to inventory and transportation activities. In the following section, these processes will be analyzed.

4.1. Supply side of the supply chain

The processes at the supply side of the supply chain deal with the operation's interface with its supply side. It mainly refers to procurement, which is purchasing the materials and services for the purpose of production and other business operations.

4.1.1. Procurement process

Procurement is very important to the business operation as well as supply chain performance. For a company, the purchasing cost is the main part of production cost. It can make up as much as 60% of the whole price of the product, thus influence the market pricing and the final profit of the company. Through effective planning, organization and control of procurement activities, it can also ensure the quality of the product and guarantee the smooth flow of the operation process.

For the supply chain management, procurement provides the sources and triggers for the supply chain activities. A well integrated procurement system can closely link the external suppliers to the inside supply chain activities to secure a smooth business operation, physical distribution, information exchange and cash flow. Besides, procurement can also play an important part in saving supply chain cost and facilitate communication. Thus the integrated supply chain formed by the strategic alliance between upstream and downstream companies can give a specific competitive advantage to the company.

As the starting point of logistic activities, procurement covers the whole flow of goods, services, technology and information between supplier and the company. A procurement decisions including the choice of procurement methods, procurement type, procurement amount and the procurement place, as described in the five 'right' principle²⁴, procurement decisions are dealing with the acquisition of goods/services at the right price, in the right quantity and quality, at the right time, in the right place for the direct benefit or use of the business operation.

²⁴ www.thanet.gov.uk/PDF/ProcurementStrategy.pdf

- **Organizational structure of procurement**

Most companies divide up the purchasing responsibilities among their multiple divisions; they typically have several staff members who are technically doing the exact same job in different departments. But at Huawei, by centralizing all of a company's procurement needs into a single department, these redundant job positions can be eliminated. And this centralized procurement responsibilities do not mean the procurement should be totally separated from other departments. The procurement department is interdependent and closely related with other supply chain departments at Huawei such as production department, logistic department as well as financial departments, etc.

Huawei's Procurement operations are driven by an operational principle based on centralized sourcing strategies and decentralized purchasing execution. The procurement Management Committee plays four roles: the Commodity Expert Group is responsible for the strategic procurement decision. First making the decision about whether to out-source or to produce by itself, then they are involved in supplier development activities such as supplier qualification and selection; then they will negotiate and sign contracts with suppliers. They are also responsible for supplier performance evaluation and long-term relationship maintenance. According to procurement strategies and requirements, production procurement and general procurement fulfillment teams are formed to give purchase orders to suppliers and manage contracts.

- **Supplier relationship building**

Companies are not isolated entities that simply purchase goods and services from individuals who happen to be able to supply them at that particular time. Successful companies recognize the need to build bridges between their organization and the suppliers that they work with by establishing strong buyer/seller relationships. Both company and its suppliers are better served when they come together to form strong, mutually beneficial business relationships. When these relationships exist, they can drive the growth and profitability of both organizations and prevent purchasing and execution problems.

When suppliers are viewed as commodity providers, they generally do not take the time or are not given the opportunity to learn the details of the business or its vision for the future. However, suppliers that are viewed as partners are encouraged to become knowledgeable about the company, its processes, its products, and its goals. Therefore supply chain partnership is a collaborative relationship between a buyer and seller which recognizes some degree of interdependence and cooperation.

Therefore it is necessary to build an environment where a strategic relationship with suppliers is realized. First, companies should carefully evaluate potential suppliers and their backgrounds in order to select the suppliers that will best fit the needs of the business. After they pick these suppliers, companies need to negotiate contracts with these suppliers and sit down with them in order to engage in some forward planning. Both of these steps are critical in establishing stability in the supplier relationship that is

necessary for both parties to feel comfortable. Furthermore, future planning makes it more likely that the suppliers will have the resources and qualified staff available when the buying company requires them.

- **Procurement operation flow**

The procurement operation flow at Huawei is built to reflect this mutually beneficial buyer/seller relationship, the objective of this flow is the five “right” principles. In more detail, it is designed to provide continual goods/services flow with sufficient quality and at reasonable cost to keep the operation of supply chain running in order to give competitive advantages to the company. At the same time, it aims to keep finding and developing potential suppliers, smooth the operational system and to build a coordinated relationship with other departments. As shown in the figure below, the operation flow includes three aspects performed by different procurement organizations:

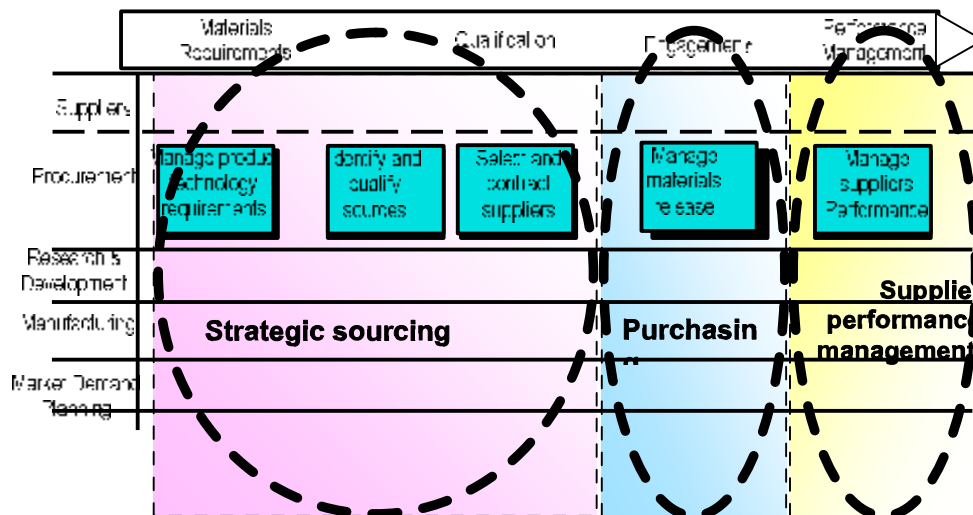


Figure 11 The procurement operation flow of Huawei

a. Sourcing: supplier qualification and selection:

The purpose of Qualification and selection of suppliers is to find the suitable suppliers that are able to provide goods and/or services with sufficient quality and at reasonable cost (at the “right” price, in the “right” quantity and quality) and are willing to build long-term relationship with Huawei by learning about Huawei’s operation and future development. Besides, they also are required to share information on the same communication platform with Huawei to exchange knowledge on final customers needs. This procurement system strives towards improved procurement processes with the aim to find a repeatable way to reduce supplier spend while simultaneously improving supplier performance and collaboration.

b. Procurement fulfillment:

The procurement fulfillment is the daily operation management of procurement activities, the fulfillment roles at Huawei are played by the Fulfillment Buyer.

Huawei uses a centralized sourcing strategy and decentralized purchasing execution. With a centralized approach to procurement, Global Procurement is the only organization that has the authority to commit funds for goods and services. Any commitments to suppliers can only be made by authorized procurement department in accordance with the established processes, with this centralized sourcing strategy, Huawei is in the position to have their purchasing team specialize in certain areas of procurement and to achieve economic of scale to ensure the “right” price.

Through decentralized purchasing, the objectives of flexible decision-making, quick response to market, and satisfying requirements of detailed parts could be enabled. As at the “right” time and “right” place requires, to have the goods arrived at customer or installation site within the required time frame is one of the main objective of procurement operation, and the average time taken from giving purchase order to the supplier to goods ready to production or shipment is also an important indicator of supply chain performance. Under this guideline, Customer Solution Procurement at Huawei is designed for oversea supply chains, its primary role is the procurement of goods and services for integration into external Customer solutions on behalf of Huawei Sales & Marketing, give oversea supply chain authority to purchase certain materials on site in response to the customers’ requirements.

c. Supplier performance management

Corporate success will increasingly be dictated by how well a company can control its supply base, create continuous performance improvement, and identify and reduce supply bottlenecks and liabilities. A whole management system should contain three steps of evaluation, classification and development.

The evaluation work mainly includes the performance tracking of all its suppliers, by tracking and evaluating suppliers’ performance, Huawei supply chain is able to determine whether or not they continuously live up to expectations, therefore to make the decision whether continue to use service from these suppliers or not. A complete and effective performance evaluation system is built to identify the service quality of all suppliers based on the total cost of the relationship, in order to concentrate purchasing volume on the best suppliers and decrease in purchasing costs. On the other hand find the bottlenecks in procurement system and eliminate them in time.

The result of the evaluation is the base of the supplier management, a classification of suppliers should be applied. At Huawei, the suppliers are classified into three layers: the strategic suppliers are the core with which a “Strategic alliance agreement” is signed. These strategic suppliers will share the core information on new product R&D, key resource procurement, new market opportunities seeking, core competitive advantage

development with Huawei. The next layer is qualified suppliers and then the market supply potential.

Improvement plans for the suppliers contain the service level analysis, the expected performance, the improvement opinions and the evaluation standard.

4.1.2. Conclusion on supply chain processes at the supply side

The section above is aimed to discuss the supply side of Huawei's supply chain in order to answer the research question of "What are current purchasing activities in Huawei supply chain". A procurement decisions such as procurement methods, procurement type, and the procurement place, etc, should follow the five 'right' principles of procurement, which is at the right price, in the right quantity and quality, at the right time, in the right place for the direct benefit or use of the business operation.

The section begin with the discussion of organizational structure of procurement, the centralized procurement department is used in Huawei instead of spreading purchasing responsibilities among her multiple divisions, this eliminates redundant job positions and ensured high effectiveness through concentration and experiences. And Huawei encourage strong supplier relationship building to recognize interdependence and cooperation therefore to prompt mutual assistance in problem solving.

Within the procurement operation flow, through the step of "supplier qualification and selection", supply chain can make sure the supplier selected will provide goods/services with sufficient quality, at reasonable cost and is willing to build long-term relationship with Huawei, from the five "right" procurement principle point of view, this step can ensure that the materials flow in will at the "right" price, in the "right" quantity and quality; Second, the procurement operation uses a "centralized sourcing strategy and decentralized purchasing execution", which ensures the goods can arrive at "right" time at "right" place; the last aspects is "supplier performance management", through the evaluation, classification and development of different suppliers, Huawei can maintain long-time relationship with strategic suppliers and be flexible with other supplier to get the best benefit for supply chain operation.

4.2. Demand side of the supply chain

The demand sides of the supply chain are those processes located closer to the customers. It deals with the operation's interface with its demand side. It mainly refers to decisions made on the inventory and Delivery model. To satisfy customers' demand is the desired end result of any supply chain management, especially for company like Huawei who have the Customer Focus Strategy as its competitive strategy. The performance of its supply chain to fill customer order is the key to win or lose the competitive battle.

Inventory and Delivery models are two factors of deciding the level of customer satisfaction by adding to supply chain flexibility. Supply chain Flexibility is its ability to respond to changes in demand, beside the manufacturing flexibility (the manufacturing part of supply chain will not be discussed in this thesis because this part of Huawei supply chain happens all in the head quarter in China, therefore has no influence on the improvement of its international supply chain management), the Flexibility also depends on the inventory model, which acts as a “flexibility buffer” to reduce lead times; and the delivery model, which decide the means and the speed of how the goods finally reach the customers’ hands. The following sections will discuss decision making on inventory and delivery models.

4.2.1. Inventory process

A supply chain may consist of many levels of production, transportation and warehousing, each level adds to the lead time. Long lead times make the manufacturer inflexible and vulnerable to unforeseen changes and inaccurate demand forecasts. If we assume lead time to be constant, the ability to fill customer orders is directly dependent on the inventory level in a supply chain. Therefore the inventory works as “flexibility buffer”, a manufacturer will account for uncertainties and unforeseen events by keeping safety stock, and the safety stock makes the product availability higher therefore assures the necessary flexibility.

But at the same time, inventories are costly, binding capital in inventory prevents the company from investing this capital in projects of higher return, the holding cost of inventory as high as 30-40% of the inventory value. In addition it is desirable to avoid dead-inventory which are products in warehouse no longer on the market or useless for the other projects.

The cost of overstocking by one unit and the lost current and future margin form understocking by one unit are the two major factors that affect the optimal level of product availability as well as customer satisfaction. Therefore the inventory management at Huawei is aims to decrease the cost of inventories without hurting the level of product availability, in another word, to maintain the optimal level of availability of balanced costs of over- and under-stocking.

- Inventory structure at Huawei

Inventory management is an important part of the Huawei order fulfillment systems. The supply chain objectives of quick response, timely delivery and at reasonable cost are deeply influenced by the level of inventory at different stages. The figure below shows the inventory structure at Huawei.

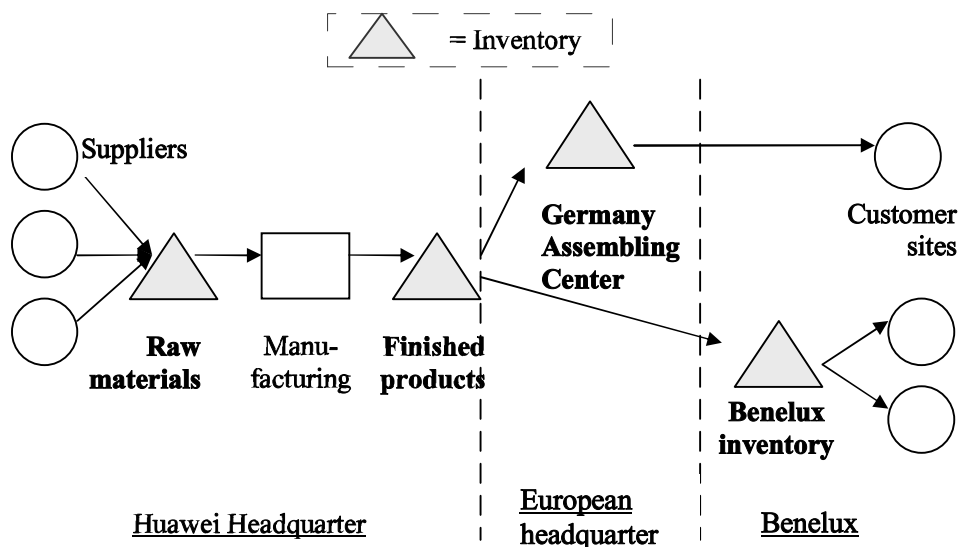


Figure 12 inventory structure at Huawei Benelux

There are three inventory located at the different levels of the supply chain; at Huawei there are inventories located at headquarter to serve the manufacturing operations as well as safety stock for her branches; the Germany Assembling Center is a semi-production warehouse, it assemble specially designed products for certain customer in Europe; The Benelux inventory located at the Netherlands, it works as distribution centers which hold the finished products (only some simple pick-up and reassembling work is done in these warehouses) which can be directly shipped to the customer site in Benelux for sale or for installation. The inventory in the Netherlands is built in order to buffer the long lead time caused by the international transportation from warehouse in China to customer sites in Benelux and to guarantee the in-time delivery of products for the installation at customer site.

Inventory at Huawei Headquarter

Inventory located at Shenzhen, Chian, the headquarter of Huawei, stock for raw products, products in the production process and finished products, the existence of these inventories mainly aims to ensure the manufacturing operations and also work as distribution center for customer in that regions.

The warehouse of Huawei at Headquarter is a comprehensive warehouse which covers the whole logistic process including inventory planning and management, as well as warehouse filed operation (receive goods, place goods, supplement goods, process the picking order, cross-warehouse transportation and transport the order), these processes are all equipped with advanced facilities and supported by a strong Information technology management. These system technologies provide a unified operation platform which can guarantee the smooth flow of logistics activities, assuring work quality by tracing the logistics information of the whole process, shortening operation time by supporting parallel operations and process information in real time, thus synchronizing logistics and information flow.

Inventory at Huawei NL

Overseas inventory operation like in Huawei technology Netherlands B.V is usually based on sales activities and after-sales services for its Benelux customers, which serves a transit station of goods during project implementation. Professional warehouse facilities and management technology helping to fulfill the project delivery goal, satisfy customer requirements, improve the logistics efficiency, and enhance the competitiveness of Huawei.

It is costly to build a warehouse by itself like in Headquarter due to the high expense of warehouse facilities and human resources, as well as lack of oversea experience. With a view to improving the efficiency, cutting down the costs and reducing the risk, the overseas project team need not appoint storekeepers, purchase equipment and provide storekeeping services by itself for the overseas logistic projects. The supply chain of Huawei NL utilize more professional services including the warehouse, other office and operation premises, equipment, personnel, management and network provided by external resources.

Using third part logistics providers can save cost for Huawei NL supply chain, but it also brings problems on the communication and information exchange between Huawei and its Logistic service provider (LSP for short) because different companies use different information systems which are not compatible with each other. The project team has very limited access to the inventory record of the LSP, they have to give the requirement information from the installation site and delivery order to the warehouse through the hand of logistic staff in supply chain, therefore the information transfer may be not reliable, exact and in time. Besides, there are also difficulties for the LSPs of different sites in different countries or regions to exchange inventory information because different LSPs are used for different sites, the information systems are also not compatible with each other, the inventory information can not be transferred freely and timely, thus may cause the situation that one site in Europe over-stocks the returned or discarded materials or products from installation, but another site of countries nearby the same materials are required, but due to the lack of a unified information exchange platform, these materials can't be replenished with each other.

- Inventory control at Huawei

How to keep the product availability to satisfy customers and at the same time keep the inventory cost low is the key issue for inventory management for Huawei as well as other companies. There are many methods that can be applied to reduce inventory and increase product availability therefore to improve supply chain profitability.

Reducing the total cost of ordering and holding inventory are two key factors to keep inventory expense low. but high holding costs are the nature of the telecommunication industry, the telecommunication requirements, especially those terminal products (for example phone and handset) depreciated at a very high rate, under this kind of short

product lifecycles, long-time storage in inventory will bring a lot of losses of the product value.

But at the same time, Huawei is in the position to make ordering costs very small through long-term relationships with its suppliers and transportation providers, along with information technology on the procurement activities which can make it affordable through economic of scale, Huawei made ordering a very small percentage of the overall cost. By lowering ordering costs, Huawei made ordering small batches with greater frequency a profitable reality. High holding costs and low ordering costs are factors that drive JIT (Just In Time), and it is the ability of Huawei to lower ordering costs that make JIT a feasible solution. Otherwise, the increased frequency in ordering in small batches will result in cost increase, which may offset the supply chain efficiency JIT can bring.

The Just-in-time inventory system is designed to ensure that materials or supplies arrive at a facility just when they are needed so that storage and holding costs are minimized. The JIT system requires considerable cooperation between the supplier and the customer. The customer must specify what will be needed, when, and in what amounts. The supplier must be sure that the right supplies arrive at the agreed-on time and location.

One benefit JIT can bring is its ability to reduce the holding inventory, in more details, the safety stock, which is quantity of stock held to satisfy unexpectedly high requirements in the stocking-up period, it will keep the stock level till in which the dead stock or stock-out situation will not arise. The required level of inventory may be reduced and product availability improved if a supply chain can reduce demand variability and lead time. And what JIT does is trying to reduce the lead times and variation in lead times in order to help reduce safety stock.

4.2.2. Delivery process

Delivery model refers to the movement of product from one location to another as it makes its way from the beginning of a supply chain to the customer's hands. Transportation is a significant component of the cost supply chain incurs. In this part of the thesis, a variety of design options are discussed and compared to find out which ones are suitable for Huawei supply chain.

The function of Delivery at Huawei covers the end-to-end services during the period from customer order commitment to equipment installation and acceptance; the logistics Management Dept. is the principle responsible for the whole logistics management. It has to ensure good operation of the whole domestic and overseas logistics cycle, such as receiving, delivering, storing, transporting, etc. the high efficiency depends a large part on the support from the quick response and in-time, accurate delivery of goods with reasonable cost, the cost-saving operation can be obtained either from the part of suppliers to manufacture, or from the part of finished-products warehouse to customer site in different regions and countries. In this thesis, the second part of delivery, which is from finished-warehouse in Chain to customers site at Benelux countries, is the main

issue, because it concerns more about the international supply chain, while the first part concerns more about local delivery in China.

As part of the supply chain decision, the delivery strategy should support the company's competitive strategy to achieve strategic fit. The fundamental trade-off for transportation is between the cost of transporting given products (efficiency) and the speed with which those products are transported to customers (responsiveness). Huawei has a customer-oriented competitive strategy which decided that the direction of its design of delivery model should be built on the principle of responsiveness. The design of a Delivery network affects the performance of a supply chain, and a well-designed Delivery network allows a supply chain to achieve the desired degree of responsiveness with a low cost at the same time.

- **Factors affecting delivery models decision**

The delivery decisions include the design of the transportation network, choice of means of transport, and the assignment of each customer shipment to a particular means of transport. The following costs should be considered when making the delivery decision:

1. **Transportation cost:** since Huawei NL uses outsourced carriers, this part of cost is the total amount paid to various carriers for transporting products to customers. It depends on the price which is agreed between Huawei and its carriers and the requirement of Huawei's Benelux customers.
2. **Inventory cost:** the cost of holding inventory incurred by the Huawei's supply chain network. The delivery design is closely linked to the inventory decisions, since the best choice of model is often found by trading-off the cost of using the particular model of transport with the indirect cost of inventory associated with that model.
3. **Processing cost:** the cost of loading/unloading of each order and cost of other processing procedures associated with transportation, the custom clearance procedure for example.
4. **Service level cost:** the cost of not being able to meet customers' delivery requirements, for example late arrival, damaged products, or product loss, etc, this is the price for not reaching the responsiveness level.

- **The choice of transportation means**

Supply chain uses a combination of the following modes of transportation:

- **Air:** Flight offers a very fast and fairly expensive mode of transportation. Low-amount and high-value or time-sensitive shipments that have to travel a long distance are best suited for air transport. This transportation mode is partly used

for international shipments which are shipped from China to different countries (to local warehouse or directly shipped to customers).

- Sea: Compared to air freight; sea freight can carry larger loads at lower cost. But the disadvantage is the slow speed. This mode is also used in international shipment of Huawei.
- Truck: Truck is the most frequent transportation mode in national delivery; this mode is widely used in regional transportation of Huawei.
- Rails: It is ideal mode for carrying large, heavy, or high-density products over some distances, but the transportation time can be long. This transportation model has limited use at Huawei.

- **Delivery network design at Huawei**

The design of a transportation network affects the performance of a supply chain by establishing the infrastructure within which operational transportation decisions regarding scheduling and routing are made.

Direct shipment network

With the direct shipment network option, the Headquarter structures its shipments coming directly from the finished-products inventory in headquarter to its Benelux customers. As shown in the figure below, with a direct shipment network, the routing of each shipment is specified, and this network applies mainly for the goods with comparatively low amount but high value products such as terminal products, or under the emergence order of customers, the main transportation means is by express or by air.

The major advantage of a direct shipment network is the elimination of intermediate warehouses cost and the simplicity of operation and coordination. The shipment decision is direct and controllable, and the decision made for one shipment does not influence others. The transportation time from supplier to China to multiple customers will be short because each shipment is direct. This network is very flexible due to the short lead time in delivery procedure, if planned successfully and combined with JIT discussed in the last section, the finished-product inventory can also be reduced to zero, and thus the high supply chain responsiveness can be achieved to satisfy customers' need with a low total supply chain cost.

However, the disadvantage of this delivery network is that every shipment route is separate thus the economies of scale can not be managed, therefore the transportation and the following process cost goes high. Besides, this transportation model is not applicable for the goods with big amounts due to the limited space of flight and dispersed customer sites.

Shipments via distribution centers

The delivery network of Huawei for its Benelux customer makes the international shipments through a central distribution center (DC for short). With this model, the Headquarter does not sent shipments directly to different customers but first ships to the distribution center built for each region, in Huawei’s case, the inventory of Huawei NL for its Benelux customers, and then the local logistic staff will arrange another delivery from distribution center to different customer sites according to the instruction of the installation team. This network applies mainly for the goods with comparatively high amount or goods aims to build safety stock , and the mainly transportation means is by air which is for goods of high value and with time pressure or by sea freight which is mainly for comparatively low value goods without time pressure.

The distribution center is an extra layer between inventory at Headquarter and foreign customer sites, it can play two roles: one is to store inventory and the other is to serve as a transfer location. In either case, the presence of distribution centers can help reduce supply chain cost by taking advantage of economies of scale for inbound transportation since the finished-products inventory in headquarter is far away from Benelux customers and theirs installation sites are dispersed, and because distribution centers are located near by each sites, the outbound transportation cost is also comparatively low. On the other side, the addition of the transit warehouse in between will cause extra inventory cost. The trade-off between the cost saved on the transportation and the increase of inventory cost must be calculated and balanced before this network are carried out.

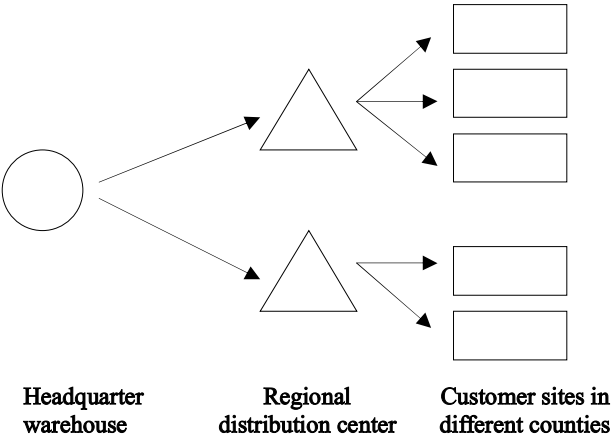


Figure 13 Networks of shipments via DCs

One special case in this network is crossdocking, which is a process in which products are exchanged between trucks so that each truck go to a customer has products from different suppliers. The use of crossdocking allows companies to lower inventories cost and handling cost because goods do not need to be moved in and out of warehouse, besides, this operation can also make product flow faster thus lift supply chain efficiency. in Huawei NL, crossdocking is used at the location of the warehouse, when international shipments arrives at the warehouse in Netherlands, some picking and handling work are operated on the shipment and then the goods are delivered again to customer sites right away without being stored in the warehouse. The crossdocking requires a significant

degree of coordination and synchronization between the incoming and outgoing shipments; it is a reflection of the coordination ability of the supply chain.

4.2.3. Conclusion on supply chain processes at the demand side

Supply chain's end target is to satisfy its customer's demand. At Huawei, to fill customer orders completely and timely is the key towards success on European market. Inventory and delivery models are two important factors of deciding the level of customer satisfaction by adding to supply chain flexibility.

The research question about inventory process is answered in section 4.2.1, the objective of inventory management is achieving quick response, timely delivery and at the same time under the reasonable cost, which is seeking the balance between the costs of over- and under – inventory stoking, because certain amount of inventory can work as a buffer to reduce lead time and add flexibility, but the cost of inventory is also very high, which will lay a heavy burden on supply chain efficiency.

At Huawei, there is inventory build at different operation levels as well as at different locations, which also play different functions. The inventory located at Huawei Headquarter including raw materials, half products and finished goods, aims mainly to serve for manufacture process, it plays a complete function of inventory planning and management, as well as warehouse filed operation; the inventory at Huawei NL servers mainly as a distribution center of goods during project implementation, it is built on sales activities and after-sales services for its Benelux customers, due to many factors such as high expense of warehouse facilities and human resources, Huawei NL use a third party logistic providers for warehouse filed operation and part of inventory management (at operation level), this is more cost-saving and efficient compare to build a warehouse by herself, but at the same time also caused the information exchange problem due to the different incompatible system used by LSP and Huawei.

The competitive strategy of Huawei makes it clear that customer satisfaction is at the first place, sufficient inventory must be build to keep high product availability, therefore how to reduce the inventory cost is the key issue, inventory cost includes inventory ordering and holding cost, the high holding inventory is the nature requirement of telecommunication industry, but Huawei can achieve low ordering cost through long-term relationship building with its suppliers and transportation providers, this together can ensure the application of JIT method to minimize safety stock , that is, only order goods when they are needed through reliable sales forecast, this is build on the base of considerable cooperation between Huawei and its suppliers as well as customers.

The research question about delivery process is answered at section 4.2.2, it discussed some delivery design options applied at Huawei Benelux, to achieve the responsiveness of supply chain promised while minimizing the total cost of fulfilling a customer order. All of the delivery options are concerned with four cost factors which affecting delivery

efficiency, these factors includes transportation cost, inventory cost, processing cost and service level cost. And the choices of transportation means from by air, sea, truck rails, or any combination of those are also discussed.

The first delivery option at Huawei Benelux is direct shipment network, which means finished-goods are transferred directly from warehouse in Headquarter to Benelux customer without stopping at any in-between inventories, this delivery design can eliminate the intermediate warehouse cost, the transportation time is short and more controllable, but at the same time the economies of scale can not be achieved by these separate shipments, so the total transportation cost is high, this option is applied mainly for the goods with comparatively low amount but high value, or under emergency order from customers; another delivery option is shipment via distribution centers, warehouse at Headquarter first ship goods to distribution center in NL, then local logistic staff arrange another delivery to customers, by taking advantage of economies of scale, this option help to reduce inbound out outbound cost (processing cost) , but it cause the local inventory cost, this option mainly for goods with comparatively high amount, or for replenish orders, it is mainly use air or sea freight, besides, the crossdocking network is supplementary to this option, in this process, products exchanged between trucks so that each truck go to a customer has products from different suppliers, it requirement significant coordination and synchronization between the incoming and outgoing shipment.

4.3. Conclusion on operational analysis

In chapter four, the Huawei supply chain is analyzed on the operational level, the supply chain was break down into several independent processes at both supply side and demand side, and these processes are procurement, inventory and delivery planning. At each section of this chapter, the current design and procedures of the process at Huawei, as well as the expectation and the goal of this process for supply chain performance are discussion to find out the most influencing factor inside each part of the supply chain network that can determine the supply chain performance.

The management of procurement at Huawei should follow the five ‘right’ principles, which is the materials should arrive at the right time, in the right place, with the right quantity and quality, and for the right price. This is the guideline for all procurement activities in Huawei supply chain. As shown in the procurement operation flow, through the “supplier qualification and selection”, supply chain can make sure the supplier selected will provide goods/services with sufficient quality, at reasonable cost and is willing to build long-term relationship with Huawei, from the five “right” procurement principle point of view, this step can ensure that the materials flow in will at the “right” price, in the “right” quantity and quality; Second, the procurement operation uses a “centralized sourcing strategy and decentralized purchasing execution”, which ensures the goods can arrive at “right” time at “right” place; the last aspects is “supplier performance management”, through the evaluation, classification and development of

different suppliers, Huawei can maintain long-time relationship with strategic suppliers and be flexible with other supplier to get the best benefit for supply chain operation.

As part of supply chain, the ultimate goal of inventory process is to reach customer satisfaction; the inventory can enhance customer service level by reducing total customer waiting time, it works as a buffer to reduce lead time and add flexibility to the supply chain, but at the same time, the high cost of inventory will reduce the supply chain efficiency, therefore the objective of inventory management is to achieve quick response, timely delivery and at the same time under the reasonable cost. Three levels of inventory is build along Huawei supply chain for her Benelux customers, the two inventories at Huawei Headquarter serves for manufacture process as well as safety stock for all branches; the Germany Assembling Center is a semi-production warehouse, it assemble specially designed products for certain customer in Europe; the inventory at Huawei NL servers mainly as a distribution center of goods during project implementation. The high holding inventory is the nature requirement of telecommunication industry, but this cost can be balanced through long-term relationship building with its suppliers and transportation providers as well as JIT method application to minimize safety stock, that is, only order goods when they are needed through reliable sales forecast, this is build on the base of considerable cooperation between Huawei, suppliers and customers.

The target of delivery management is to add the responsiveness and flexibility of supply chain while minimizing the total cost of fulfilling each customer order. Therefore the designing delivery network is very important, the delivery network should be smooth, fast and cost-effective, be able to delivery the goods to customer at the time required, besides, the delivery process should be traceable to make customer feel the delivery is reliable. The three delivery networks applied at Huawei Benelux is analyzed, one delivery option at Huawei Benelux is direct shipment network, goods are transferred directly from Headquarter warehouse to Benelux customer, this delivery design can shorten the transportation time, eliminate the intermediate warehouse cost, and easy to control, but the economies of scale can not be achieved by these separate shipments; another delivery option is shipment via distribution centers, warehouse at Headquarter first ship goods to distribution center in NL, then local logistic staff arrange another delivery to customers, by taking advantage of economies of scale, this option help to reduce inbound out outbound cost, but leads to local inventory cost; besides, the crossdocking network is also applies, products are exchanged between trucks so that each truck go to a customer has products from different suppliers, it requirement significant coordination and synchronization between the incoming and outgoing shipment.

5. Measurement of supply chain performance

After the strategic and operational analysis of Huawei supply chain, we move on to the part of measurement, this section will state a detailed description of the current supply chain and an assessment of its performance by using Balanced Scorecard (BSC for short).the BSC is a measurement and management system that enables organizations to clarify their vision and strategy and translate them into operational action.²⁵

The BSC will be applied in this research to measure the current performance level of Huawei supply chain, based on the customer-oriented competitive strategy of Huawei, it's supply chain operation will be viewed from four perspectives: the Business Process Perspective, the Customer Perspective, the Financial Perspective as well as the Learning & Growth Perspective (as shown in figure 4 below). Under each perspective, a set (four or five) of most comprehensive Key Performance Indicators (KPI for short) will be developed to measures the performance of the current supply chain system, and then based on data collected from the daily supply chain operation, to analysis the score of each KPI, so as to get the final score of the whole supply chain performance.

The reason for choosing BSC to measure the supply chain performance in this research is that: First of all, the BSC provide not only analysis all supply chain activities: procurement, warehousing and transportation on operation point of view, but also align these activities to the other aspects of Huawei, the financial situation, customer satisfaction as well as the learning and growth, therefore to provide a comprehensive vision of supply chain performance; second, the BSC increase focus on strategy, because it can aligns business activities of day-to-day basis to the vision and strategy of the organization. Third, the BSC improves organizational performance by measuring what really matters; it can focus on the key metrics that have real meaning to Huawei supply chain. The BSC approach helps to keep measures aligned with objectives. Forth, the BSC focus on the drivers of future performance, therefore lead to the continuous development.

5.1. Supply chain performance measurement

In the following part the concept of Balanced Scorecard will be used to measure the supply chain performance. At first a set of proper KPI which will determine the performance of supply chain will be designed and grouped; then those groups of KPI will be set the importance values for every metrics; the final step is the calculating the performance, using estimation of metric values, their weight and weights of their groups. The total values will tell how the operation is performing. The first two steps will be performed in this section, and the result, which is the performance measurement of Huawei supply chain, will be shown and discussed in the next section.

²⁵ <http://www.balancedscorecard.org/Home/tabid/36/Default.aspx>

5.1.1. Perspective of Quality assessment

To bring about improved Huawei international supply chain optimization, performance measurements should be executed throughout the whole Huawei international supply chain. And all participants should be involved and committed to common goals. Therefore, the perspectives of Supply Chain Balanced Scorecard should contain factors of every international supply chain components as well as the common goals throughout the supply chain such as customer satisfaction.

Under this guideline, the perspectives of the Balanced Scorecard application include: the Quality assessment for various supply chain processes (procurement activities, inventory and delivery network design), customer satisfaction, financial performance measurements and The Learning & Growth opportunities.

- **KPI for Procurement Performance Management**

According to Huawei's competitive strategy we can learn that to better server the customers is the objective of both company and its supply chain. Procurement activities as the starting point of supply chain, is the input of final goods delivered to customers. Therefore the sufficient quality and quantity of the materials, arrive at right place in right time is of more importance than the materials cost, and should be secured in order to ensure the responsiveness of supply chain operation. So the purchasing and supply management must analyze on a periodic basis their supplier abilities to meet the firm's long-term needs.

Average material standard lead time: this KPI refers to the time frame taken (In "right" time) from giving purchase order to the supplier to purchased goods received at local warehouse (here it refers to the warehouse of Huawei Netherlands), or arrived at specified customer sites (At "right" place), by average for a certain period, usually on monthly basis.

Defect rate due to material reason: there are many factors could leads to the defect products during the production stage, one of the factor is the quality or quantity of the materials didn't reach the standard level of production. Through this KPI, we can detect the rate of the defect which is due to the material reason. From the "five procurement principle" point of view, if reflect the "right quality" and "right quantity".

- **KPI for inventory performance management**

To satisfy customers' demand is the desired end result of any supply chain management, especially for company like Huawei who have the Customer Focus Strategy as its competitive strategy. Inventory as part of supply chain can helps to increase customers satisfaction by reduce customer lead time and add to products arability, so as to increase supply chain responsiveness and make it in line with Huawei customer-oriented strategy. Therefore the KPI for inventory performance should focus more on how customer service level can be enhanced by inventory decision.

Inventory Turnover rate: The number of times that inventory cycles per year of the warehouse of Huawei Netherlands. It is one of the most commonly used Supply Chain Metrics. This KPI can tell how fast the customers' orders are satisfied, as telecommunication products have short life cycle, it will devalue very fast when stored as inventory, having long inventory period is neither in customers' interest nor good for Huawei's investment. It is calculated by dividing the annual costs of goods shipped from headquarter by the Average Inventory Level.

Inventory accuracy: this KPI is set to check the consistence to which data provided by warehouse LSP is in agreement with the actual quality and quantity, to make sure the right goods can be ordered and delivered to customers, is set to check the management and control ability of oversea branches to their outsourced warehouses; it is the percentage of dividing the counting difference (between actual on-hand quantity and perpetual inventory quantity) by the total amount of perpetual inventory quantity.

Inventory ABC Classification: it is a method to categorize the inventory goods. Inventory management is a dynamic process, the uncertainty in supply and demand is constantly changing, inventory policies should not only be made to stock goods but also manage goods to meet customer requirement, facilitate delivery and save cost, and they should be periodically adjusted to reflect all changes in the market. The ABC classification is set for the purpose of reflecting these changes by categorizing different items and managing them in different policies. This method will allow you to identify and categorize the inventory goods with different value and importance so that different inventory policies are applied to save the overall carrying cost of inventory.

- **KPI for delivery performance management**

Delivery is a primary determinant of customer satisfaction, because its performance can be evaluated by customer directly, it, therefore in order to fit the strategy requirements, measuring and improving delivery performance is always desirable to increase competitiveness.

On time delivery rate: On-time means shipped on or before the requested ship date (except if the receiving party such as customers or installment sites does not accept early shipments), this KPI evaluate whether goods can be delivered at the time required by customer, and it is an important measurement of supply chain ability on responsiveness. On-time delivery Performance is a calculation of the number of Order Lines shipped on or before the Requested Ship Date verses the total number of Order Lines.

Shipment visibility/traceability percent: when customer place and order, they expect to know the process status and the completion date, by offering the status track and trace, it can give customer a reliable feeling of Huawei's customer service level. This KPI is calculated by dividing the total number of shipments via carriers with order tracking systems, by the total number of shipments sent during a period. It is building on the

relative sophistication of the delivery network design and the ability of the supply chain IT system.

Transit time: Measured by the number of days from Huawei headquarter to Huawei customers or installation sites. This is often an important component of lead time. Transit times can vary substantially, based on freight mode and carrier systems.

5.1.2. Perspective of Customer satisfaction

The level of customer satisfaction is closely related to Huawei's customer-oriented competitive strategy, it is also the requirement of a responsive supply chain, therefore the KPI should cover different aspect of customer service level.

Supply Chain Cycle Time: the supply chain cycle time refers to the total order cycle time between the receipt of customers order until the finished goods ready to be delivered to the customer, the reduction in order cycle time leads to reduction in supply chain response time which is an important source of competitive advantage. It also helps to identify the customer order path, through analyzing these customer order paths, non-value adding activities can be identified and eliminated. The supply chain cycle time is calculated by adding up the longest lead times in each stage of the cycle.

Order complete fill rate: the Order complete fill rate reflects the reliabilities of delivery, which is the next stage after the indicator of "Supply Chain Cycle Time", The percentage of scheduled required PO line divided by the actual completely arrival PO lines of Huawei Netherlands during certain period, most of times a month. This KPI is set to describe the order fulfill rate of the international supply chain.

Customer Claims percentage: this KPI can lead Huawei to find out where and in which level the customer satisfaction is not reached, and lead to the future improvement, therefore it is a resource of growing. It is calculated by the total times of order which received claims from customers divided by total purchasing orders for a certain period. This is an outside indicator directly coming from customers; it reflects the total performance of all the supply chain activities.

5.1.3. Perspective of Financial performance

The efficiency of a supply chain can be assessed using the total logistic cost, the financial measure. One aim of supply chain design is efficiency and cost-effectiveness while retaining responsiveness. Thus it is necessary to assess the financial impact on supply chain on both strategic level strategies and operational level.

Cash to Cash Cycle Time: it is essential to determine how the cost associated with each asset, combined with its turnover, affects total cash flow time. It is calculated as the number of days between paying for Raw Materials and getting paid for product by

customers. It is calculated by Inventory Days of Supply plus Days of Sales Outstanding minus Average Payment Period for Material. The Cash to Cash Cycle Time can determine the productivity of Huawei supply chain as well as the profitability of the whole company.

Volume delivery expense: a cost effective distribution system is the aim of the delivery network design, measuring individual cost elements together with their impact on customer service encourages trade-offs that lead to a more efficient supply chain system, the KPI of freight cost per unit shipped is calculated by dividing total international and local delivery costs (including freight cost and customs clearance charge at customs) by the shipment volume (measured by kilo meters)

Volume storage expense: Calculated by dividing total inventory costs (including storage cost and inventory handling cost like inbound, outbound and picking) by the goods volume (measured by kilo meters) . Since supply chain management cut across functional boundaries, care must be taken to assess the impact of actions to influence costs in one area in terms of their impact on costs associated with other areas. Thus the cost on inventory is tight associated with cost on other functional part like delivery expense.

5.1.4. Perspective of Learning and Growth

Employee turnover rate: Turnover is calculated by dividing the number of annual terminations by the average number of employees in the work force. It gives a signal of the company's employee treatment. High turnover rate means employees of that company have a shorter tenure than those of other companies in that same industry.

R&D investment ratio: calculated by the expense invested in R&D area compared with total sales revenue. R&D investment generally reflects a government's or organization's willingness to forego current operations or profit to improve future performance or returns, and its abilities to conduct research and development. As stated in Huawei's company mission, in order to consistently create maximum value for customers, Huawei need to develop and design new technology and products to satisfy its customer's increasing requirements, and in an industry that is fast changing like telecommunicate industry, companies have to continually revise their design and range of products in order to survive and grow.

5.2. The performance of Huawei supply chain

The current performance of Huawei supply chain will be measured by Balanced Scorecard in this section.

5.2.1. Guideline through the BSC measurement table

The table for measuring Huawei supply chain performance through Balance Scorecard is designed as below:²⁶

The “**Perspective**” column lists the perspectives of supply chain which will be evaluated;

The “**KPI**” column is the KPIs which will be used to evaluate those perspectives;

The “**Weight**” column is the weight of KPI in this perspective, in other words, the importance of this indicator in evaluating the performance of the perspective, the total weight of every perspective is 10, which is distributed in each KPIs.

The “**Calculation**” column shows how the KPI will be measured;

The “**Score guidance**” column shows how the score for this KPI measurement will be calculated. The total score for each KPI is the weight of this KPI in its perspective.

The “**Actual performance**” column shows the current performance situation of Huawei supply chain through my research.

The “**Score**” is the result of comparing the **Actual performance** to the **Score guidance** to get the score of Huawei supply chain’s current performance.

²⁶ For the model of the BSC measurement table, please refer to the Balanced Scorecard designer website:
http://www.strategy2act.com/download_metrics.htm

5.2.2. Measurement of Huawei supply chain performance

Perspective	KPI	Weight	Calculation	Score guidance	Actual performance	SCORE
Procurement						8
	Defect rate due to material reason ⁱ	5	the rate of the defect which is due to the less quantity or quality of material	5 points = 0-30% 3 points = 30-50% 1 points = 50% percentage	Around 24%	5
	Average material standard lead time ⁱⁱ	5	The time period from the creation of PO until goods receipt at the warehouse reported.	5 points = 1-3 3 points = 3-5 1 points = 5+ days	Around 3 days	3
Inventory						7
	Inventory Turnover rate (monthly) ⁱⁱⁱ	4	(Dividing the annual costs of goods shipped from headquarter by the Average Inventory Level)*12	4 points = 15 3 points = 10-15 2 points = 5-10 1points = 5- times	12.35 times	3
	Inventory accuracy ^{iv}	3	Percentage of dividing the counting difference by the total amount of perpetual inventory quantity.	3= >99% 1= 90-99% 0 = <50%	99.7%	3
	Inventory ABC Classification ^v	3	If classification method is applied at the inventory in Huawei NL	3= comprehensive 1= yes but incomplete 0= No	classified by customer group	1
Delivery						7
	On time delivery rate ^{vi}	4	the number of Order Lines shipped on or before the Requested Ship Date verses the total number of Order Lines	4 = >95% 3 =90-95% 2 =60-90% 1 = <60%	90.48%	3
	Shipment visibility/traceability percent ^{vii}	3	dividing total number of traceable shipments, by total number of shipments sent during a period	3 = around 100% 2 =50-100% 1 = <50%	60%	2
	Transit time ^{viii}	3	the number of days from the time a shipment leaves Huawei headquarter warehouse to the time it arrives at the customer or warehouse	3 points = <80% 2 points =100-150% 1 points = >150% of standard transit time	122%	2
Customer satisfaction						8
	Supply Chain Cycle Time ^{ix}	3	Total order cycle time between the receipt of customers order and the finished goods ready to be delivered to the customer	1 points = >10 2 points = 6-10 3 points = <6 days	4.75 days	3

	Order complete fill rate ^x	4	the percentage of scheduled required PO line divided by the actual arrival PO lines of Huawei Netherlands during certain period	4 = >95% 3 = 90-95% 2 = 60-90% 1 = <60%	91.9%	3
	Customer Claims percentage ^{xi}	3	Percentage of order which received claims from customers	1 points = >50% 2 points = 30~50% 3 points = <30%	35%	2
Financial performance						7
	Cash to Cash Cycle Time ^{xii}	4	The number of inventory days of supply plus days of sales outstanding minus average payment period for material.	1 points = >90 2 points = 30-90 3 points = <30 days	Around 50 days	2
	volume inventory rate ^{xiii}	3	Calculated by dividing total inventory costs by kilo meters	3 = <500 2 = 500-1000 1 = >1000 EUR	EUR 470.67	3
	Volume delivery expense ^{xiv}	3	divide total freight costs (international and local parts) by square meters	3 = <500 2 = 500-1000 1 = >1000 EUR	EUR 615.88	2
Learning & Growth						7
	Employee turnover rate ^{xv}	3	divide number of annual terminations by average number of employees in the work force	1 = >30% 2 = 15%-30% 3 = <15%	20%	2
	R&D investment ratio ^{xvi27}	7	expenses invested in R&D area compared with total sales revenue	1 = <3.5% 3 = 3.5%-7% 5 = >7%-15% 7 = >15%	9.8%	5
Total Performance score in Huawei international supply chain by Balanced Scorecard						7.4

Table 1 The Performance score calculation of Huawei supply chain by BSC

According to the performance measurement table above, we can have a more detailed idea of how well is the Huawei international supply chain's performance. As we can see that the score of Inventory, the Huawei supply chain is functioning in a good way, as its average score is 7.4, but every indicator in each perspective have difference performance, so it is necessary to find out which aspects of these perspective is under the average performance and concentrating on improving this, and this will be the main topic for next chapter.

²⁷ Please see all the footnote at the end of the thesis

6. Improvement implementation and Recommendations

Using the performance measurement in chapter five, we can find the weakest points of Huawei international supply chain which should be improved upon. As we can see that the score of Inventory, delivery network design as well as financial performance are lower than the final average score of 7.4, finding opportunities and suggesting improvements in these aspects is the main task performed in the following sections.

6.1. *Promising opportunities for improvements*

6.1.1. Opportunities for inventory management

Both of the following indicators: **Inventory Turnover rate** and **Inventory ABC Classification** in the measurement of inventory management are not satisfying, so the following sections are aimed to find improvement opportunities in these aspects.

- **Inventory Turnover rate**

This KPI reflects the management and control ability of overseas branches to their outsourced warehouses. As discussed above, the inventory and delivery activities of Huawei Benelux supply chain are out-sourced to independent logistic partners. When entities of supply chain belong to different organizations, the outsourced logistic partner does not have a common information platform on which to exchange and analyze the inventory information with Huawei NL. This inconsistency makes the management of inventory performance different. Besides this, each organization has its own performance measurements and evaluation responsibilities. Organizational barriers that may inhibit coordinated inventory control include differences in objectives and performance metric, misunderstandings on inventory ownership, and unwillingness to commit resources to extra requirements from Huawei.

For internal reasons, an integrated supply platform built on the IBM solution and i2 solution has already begun to be applied at Huawei. This information system is a great help for smoothing the supply chain procedures, lifting the inventory turnover rate and reducing lead times. But this information system's advantage seems not to have reached the international supply chain yet. For example, the headquarter has limited access to the inventory information of Huawei Benelux, and the European branches such as Huawei Benelux and Huawei France have no idea of each other's inventory level. Therefore the experience and resources can not complement each other to reduce the overall inventory level and save shipment cost.

Another weak point is the separation of supply chain design from project installation decisions might lead to conflict of company's best interest. What is agreed to be the most suitable inventory strategy in Huawei Benelux supply, such as reducing inventory or

adding a distribution center in the supply chain network, may not be in the best interest of the project manager and the site installation team. The main consideration of supply chain is most of the time the fixed costs of the warehouse, the handling costs as well as the logistic operation. The effects of these policies on project installation efficiency factors, such as order response time and customer service level, are often an afterthought. On the other hand, when project managers make decisions on site, they only consider what is best for the site installation instead of what is most cost-effective for the supply chain. The imperfect coordination between these two parts may lead to excessive inventory and low inventory turnover rate.

- **Inventory ABC Classification**

At Huawei Benelux supply chain category inventory is divided into three different categories according to different customer location and usage. These three main categories are: the Belgium Mobistar inventory; the Dutch customers' inventory and RMA inventory (for returned and scrap). DHL EXEL, the warehouse LSP, has different management staff and systems referring to different inventory and hands in its inventory daily reports separately. By dividing inventory by customer location, the special requirements of different customers can be protected.

This classification however, is not totally satisfying in my opinion. Because the installation projects across different customer groups have similar requirements and site configuration, while the current classification method cannot make use of this. Therefore the picking and packing work is less efficient and certain materials are short at one customer location and in surplus at another.

6.1.2. Opportunities on delivery management

The following indicators: **On time delivery rate, Shipment visibility/traceability percent** and **Transit time** in the measurement of the delivery network design and management are not satisfying. The following sections are aimed at finding improvement opportunities on these aspects.

- **On time delivery rate**

The cause of imperfect on time delivery might be the imperfect management of the outsourced Logistic Service Provider. As mentioned before, Huawei out-sources its warehouse and delivery activities in the Benelux to an independent logistic company. This has the risk for Huawei NL that the outsourced logistic partner is not as manageable as its own team.

The logistic partner has a limited understanding of Huawei competitive strategy and the responsiveness required to satisfying customers. The performance of goods delivery, for example, can only be measured from results outside Huawei NL (from customer reflection or from logistic partner's feedback), and the reasons which actually caused

unsatisfying results cannot be tracked properly. Therefore the improvement plan may not be the correct one. Even if the improvements plan is right, it can only be suggested and may not be implemented as Huawei desired in the end. Also the communication is not as fast and accurate as within one team. Besides this, the cultural differences between Huawei, Chinese dominated company, and a local European logistic company might influence the cooperation.

- **Shipment visibility/traceability percent**

From the customer's point of view, when they place orders, they want to know when their products will arrive and be installed. While waiting, they may also want updated order delivery status. Huawei should track delivery performance and keep customers apprised of their order delivery status. The ERP system offers complete information platforms at Huawei headquarter. The delivery status of every step can be tracked and updated in time. Therefore customers can be informed of delivery status in time and in detail. But at her oversea branches, because of different operation models and business environments at each countries or region, the information platform is not as comprehensive and consistent as at Headquarter. The outsourced logistic partners do not have a common information platform on which to exchange delivery information in time with Huawei NL. Any disconnection and delays in information retrieval and transmission make it impossible to quote accurate shipment dates to customers. Customers at Benelux thus cannot be provided order delivery information by Huawei NL at any time they want.

Another problem is that due to the inefficient information platforms at overseas branches, the databases at different operating points that describe system environment, inventory / backlog status, future production plans, and so on, are not consistently linked to each other.

- **Transit time**

Although the Delivery activities are outsourced to an external LSP, the ability to manage carriers can ensure the smooth transit of goods and on-time delivery. Assuming that the standard transportation periods for different transportation modes are constant (by express, by air, sea or by truck shipment), and the performance of each outsourced logistic partner has little variance, then the transit time is mostly depend on three factors:

Whether the shipment can start at the expected time: because the flight and ship must be booked in advance, it is often difficult to book the flight or ship at the date expected during transportation peak seasons.

The communication ability between supply chain and the carrier, or between two different carriers: the smooth joint between these parties is very important, because a lot of transit time is not wasted in transport but, for example, at customs. When the shipment has arrived and customs cleared but is waiting for a delivery instruction from Huawei supply chain or a hand-over of the shipment to another local carrier. Besides the lost time, this also leads to large amount of unnecessary warehousing charges at the airport.

The choices of delivery network design, in order to make use of the Dutch deferment license to save VAT cash flow, a delivery network called “HUB” is set in the Netherlands. With this network, the shipment from headquarter to other European countries such as Germany or Austria would go through this center in the Netherlands for further transfer or temporary storage. The time spent on activities such as inventory inbound, placement and outbound adds extra time to every shipment.

6.2. Improvements implementation

6.2.1. Implementation plan on Inventory management

- **Inventory Turnover rate**

As we have discussed above, the key reason for the low inventory turnover rate is due to the separation of information systems between out-sourced warehouse keeper and Huawei Benelux’s own information platform. The limitation for Huawei Headquarter and oversea branches to access to each other’s inventory level as well as the organizational boundary between supply chain department and project installation team.

Effective operation of a supply chain requires coordination of key information exchange from different entities in the aspects of order forecasts, inventory status, and delivery schedules. The Huawei Benelux should build a strategic cooperation relationship with the out-sourced logistic provider (this mainly refers to the warehouse logistic partners). The logistic partner should have an overall knowledge of Huawei’s products, customer requirements as well as the installation plans. Huawei Benelux should make forecasts regularly to its logistics partners.

An information exchange platform should be built to integrate all headquarter and international branches. This way the inventory level, surplus or lack of products can be shared through the whole international supply chain.

Since project installation teams decisions will directly affect inventory level and shipment arrangement and thus affects the overall supply chain performance, a cross-functional team should be organized to make the decision together by both supply chain and project team to reduce-organizational boundaries.

- **Inventory ABC Classification**

According to the current inventory policy of Huawei Benelux, multi-dimensional inventory classification should be built including both customer location and site configuration because the similarity of sites configuration across different customer groups.

The first classification layer should be the site configuration and within this, the second classification of customer location is made. In this way the inventory picking and management would be more efficient, mutual benefit within different projects can be achieved, and specific customer requirements can also be secured at the same time.

6.2.2. Implementation plan on Delivery management

- **On time delivery rate**

An appropriate combination of company-owned and outsourced delivery to meet customers' requirement should be considered. This decision should be based on a firm's ability to handle transportation profitably as well as the strategic importance of delivery to the success of the company. In general, outsourcing is a better option when shipment sizes are small and high responsiveness is not required, whereas building its own delivery team is more suitable when the shipment sizes are large and responsiveness is important.

- **Shipment visibility/traceability percent**

An appropriate information technology can help decrease costs and improve responsiveness in the total delivery networks, especially for Huawei NL which uses outsourced logistic service providers, the importance to build a common information platform between two parties to accelerate fast and accurate information exchange and performance feedback is even more notable.

In order to compensate the shipment invisibility caused by incompatibility between Huawei Benelux and its LSPs, Huawei needs to work harder with its LSP's to discover an interface or platform on both systems that can recognized the input and output of each other's business systems by using technologies, for example, bar code.

- **Transit time**

As mentioned previously, there is a key point in the model in section 4.2.2, where the booking of a flight or ship; the communication between supply chain and carriers or between carriers; and whether it go through distribution center.

It is advisable to make sales or delivery forecasts (communication skills and building a cooperative relationship with customers are required), so that the booking of flights or ships can be done in advance to ensure transit time especially in peak season;

Regular feedback and information exchange should be performed between supply chain and carriers and between different parts of carriers in order to ensure smooth hand-over procedures between carriers. For example, the email distribution list about Estimated Time of Arrival (ETA for short) should include both parties, and Huawei supply chain staff should keep a close watch on the ETA and monitor whether the transfer connection

is correct. Besides this, meetings of both sides should be held regularly to promote smooth communications, and positions responsible for correspondence should be appointed.

Shipments via distribution centers should be avoided if possible, because the time spent on activities such as inventory inbound, placement and outbound for every delivery adds extra time to every shipment. However the extra time spent on these activities can be reduced by smoothing the joints of every different shipment parts, for example, by using the same logistic service providers for both shipment as well as inventory management can make the transit faster and reduce the risk of losses.

6.2.3. Implementation recommendations

As we can see from the implementation plan for each weak-performed supply chain process, most of the plan is focused at the development of an information exchange platform between Huawei headquarter supply chain's system, Huawei Benelux supply chain's system, and out-sourced logistic service provider's systems. This information exchange system is costly to build, but seen from a long-term point of view, the importance of the use of information exchange systems is widely recognized by more and more international companies.

The development and/or upgrading of information exchange systems should be carefully investigated and planned because it would not only add to the operation system technically, but it involves "soft" parts, for example, the design principle and the way of working attached to the system and the personnel working on them. This is affected not only by different company cultures but also country cultural differences which exists between Chinese and western countries cultures.

A clear and strict organization arrangement such as information sharing and exchange policies and structure formats is highly required. This can help in overcoming cultural differences, and result in building and sustaining cooperation between both internal and external parties of Huawei supply chain.

The trend of E-supply chain philosophy should be further applied in supply chain operation. As the internet is providing immediate benefit to the business world as well as supply chain optimization, and shows great long-term promise, how to use the internet's ability to remove inefficiencies, break down communications barriers, reach disparate audiences and foster collaboration is more and more discussed on the internet, which is the new trend of supply chain development. The potential value it can bring to Huawei international supply chain is of great interest for future discussion.

7. Conclusion and Reflection

7.1. Conclusion

This report is executed on a strategic level, focusing on how supply chain components are integrated together to match the overall competitive strategy of the company and fit the external environment. It concerns the supply chain decisions which will have a long term effect. The objective of this report is to find a supply chain model from literature and practice that best fits the situation of Huawei, and then compare the actual performance of Huawei supply chain to this model in order to improve the current supply chain network in Huawei.

Through internal and external strategic analysis, chapter three aims to answer the research question “What is the strategic position of Huawei supply chain”. By analyzing whether the current Huawei supply chain strategy fits the competitive strategy of the company and its environmental needs. In the first part of the internal analysis, the strategic fit between Huawei’s competitive strategy and the supply chain strategy is discussed. Through answering the first research question “What are the mission, vision, goals, and strategies of Huawei” in section 3.1.1, the strategic fit between Huawei’s competitive strategy and supply chain strategy is discussed. The customers demand in Benelux is characterized as high uncertainty. Therefore the competitive strategy is built as a customer-focused strategy. Huawei chose a responsive supply chain to meet the requirements of its Benelux customers. Therefore a strategic fit is achieved by both company competitive strategy and supply chain strategies aiming to the same goal of customer satisfaction. The processes and the responsibility of each process are discussed into detail through a process view of the supply chain in section 3.1.2. The second part discusses the competitive strategy of Huawei and the environmental influences. The “PESTEL” framework is applied to analyze the changes brought by political, economical, legal, environmental, and technological aspects of the macro-environment at section 3.2., and the research question “the opportunities and threats from the European market” is answered. A SWOT analysis is carried out to develop the opportunities and threats from the European market as well the strengths and weaknesses of the supply chain. In section 3.3 through the research of last two sections, this also answers the research question “the strength and weakness about the supply chain performance of Huawei” and “the opportunities and threats from the European market”.

Chapter four is designed to answer the question “What is the operational situation of Huawei supply chain?” the main processes from supply and demand side of supply chain are explained. Section 4.1 discusses the supply side of supply chain, all the procurement process is aimed to reach the five “right” principles, and a single centralized procurement department is applied at Huawei procurement structure to eliminate redundant job positions and ensure high effectiveness. Huawei encourages strong supplier relationship building to prompt mutual assistance in problem solving. In section 4.2 the demand side of supply chain is discussed. Fulfilling customer orders completely and timely is the key

for Huawei to compete on the European market. Inventory and delivery models are two important factors of deciding the level of customer satisfaction. The research question about current inventory activities is answered at section 4.2.1, the objective of inventory decision is achieving quick response, timely delivery and at the same time at a reasonable cost. The research question about current transportation activities is answered at section 4.2.2. Several delivery design options applied at Huawei are discussed and compared to achieve the responsiveness of supply chain promised while minimizing the total cost of fulfilling a customer order.

Chapter five discusses the measurement and current performance of Huawei supply chain which is appointed at research question three. A Balanced Scorecard measurement model is applied to measure the current performance. In section 5.1 the KPI designed for four perspectives of balanced scorecard: quality assessment (including various supply chain processes: procurement, inventory and delivery), customer satisfaction, financial performance and financial performance are explained and specified to answer the research question “What are the KPI for measuring the performance of supply chain activities”. After the BSC is executed, the research question “How does Huawei’s international supply chain operate and what is its performance” is shown in the form of a table in section 5.2. Each process get a score: procurement (8 of 10), inventory (7 of 10), delivery (7 of 10), Customer satisfaction (8 of 10), Financial performance (7 of 10), Learning & Growth (7 of 10). And the final score of supply chain performance is 7.4.

In chapter six the research question “What improvements can be made in Huawei international supply chain and how can these be implemented?” is answer, according to the performance measurement in last chapter. Promising opportunities for Huawei supply chain are detected from the KPI score of each supply chain process in section 6.1. Then opportunities and possible improvements on these perspectives are found in section 6.2.

The unsatisfying performance of Inventory Turnover rate is caused by management inconsistency and organization barriers between Huawei and out-sourced logistic partners, as well as the integrated supply platform applied at Huawei headquarter haven’t cover her oversee branches’ information system currently. In order to improve this, Huawei Benelux should build a strategic cooperation relationship with out-sourced logistic providers to exchange inventory information, customer requirements. Huawei Benelux should make forecasts every certain time to the logistics partners and an information exchange platform should be build to integrate all headquarter and international branches. Regarding to Inventory ABC Classification, the current inventory classification only classify inventory by customer location, didn’t make use of the similar requirements needed by installation project across different customer groups, therefore make the picking and packing work less efficient and one certain materials in short at this customer location and surplus at another. Therefore inventory classification of multi-dimension should be built including both customer location and site configuration because the similarity of sites configuration across different customer groups.

Regarding to on time delivery rate, because delivery activities is out sourced to third partner, they have limited understanding of Huawei competitive strategy and the

responsiveness required to satisfying customers , therefore the performance are not as manageable as Huawei own team, in this case, an appropriate combination of company-owned and outsourced delivery team to meet customers' requirement should be considered. Regarding to shipment visibility/traceability percent, the information platform is not as comprehensive and consistent as at Headquarter because operation models and business environment at each counties or region are different, and the outsourced logistic partners of Huawei NL do not have a common information platform on which to exchange the delivery information in time with Huawei NL. Therefore it is import to use EDI technology to build a common information platform between Huawei and its delivery partner to accelerate fast and accurate information exchange and performance feedback is even more notable. Transit time, which is deeply influenced by three factors, in case of whether the shipment can start at the time expected, It is advisable to make sales or delivery forecast, so that the booking of flight or ship can be performed in advance to ensure the transit time especially on peak season; regarding to the communication ability between supply chain and the carrier or between two different carriers, Regular feedback and information exchange should be performed between different parties in order to ensure smooth hand-over procedures between carriers; as for the choices of delivery network design. Shipments via distribution center should be avoided if necessary, in order to smooth the joints.

7.2. Reflection

7.2.1. Reflection on cycle view model of supply chain

In chapter three the **Cycle view** of supply chain is used in section 3.1.3 to analyze the internal supply chain operation of Huawei, the cycle view refers to a model in which the processes in a supply chain are divided into a series of cycles, each performed at the interface between two successive stages of a supply chain. The cycle view clearly defines processes involved and the owners of each process; it specifies the roles and responsibilities of each member and the desired outcome of each process.

However, as a reflection on this model, the cycle view has its disadvantage of understanding the supply chain operation. In this view, processes in a supply chain are divided into a series of cycles, each performed at the interface between two successive stages of a supply chain (see Figure 9: Supply chain process cycles of Huawei). A cycle view of the supply chain clearly defines the business processes and activities involved and the owners of each process and relative roles and responsibilities. Furthermore, because of inventory being held between the cycles, the main processes are decoupled to a certain extent. This implies that it views each process in supply chain only performing its own function independently without coordination with other chain partners. This view opposes the 'Just-In-Time' (JIT) philosophy of inventory management as discussed as the driver of inventory in section 4.2.1, which emphasizes the breakdown of function borders between processes, and the decoupling of activities by inventories should be eliminated, since it reduce supply chain visibility and supports the sub-optimization of the supply chain.

7.2.2. Reflection on SWOT model

A **SWOT analysis** in this thesis is used in section 3.2.3, chapter three, to summarize the key issues from the business environment around Huawei supply chain, and the strategic capability of this department that are most likely to impact on strategy development of Huawei .

The SWOT analysis tool is great for developing an understanding of an organization or situation and decision-making for all sorts of situations in business organizations. SWOT analysis examines the Strengths, Weaknesses, Opportunities, and Threats of Huawei supply chain relative to those of competitors. The strengths and weaknesses are competences and resources of the supply chain, and the structure and procedures which are under its control, the strengths and weaknesses are collected through an internal strategic analysis of Huawei supply chain in section 3.1 and the opportunities and threats which the supply chain department faces from trends and changes in its environment not under the control or influenced by their actions, the opportunities and threats are collected through environmental analysis in section 3.2.

The extensive application of SWOT analysis: The SWOT analysis can match specific internal and external factors, which creates a strategic matrix and which makes sense. Thus the four combinations can also be applied as maxi-maxi (strengths/opportunities), maxi-mini (strengths/threats), mini-maxi (weaknesses/opportunities), and mini-mini (weaknesses/threats). Wehrich (1982) describes the four combinations as follows:

1. Maxi-maxi (S/O). This combination shows the organization's strengths and opportunities. In essence, an organization should strive to maximize its strengths to capitalise on new opportunities.
2. Maxi-mini (S/T). This combination shows the organization's strengths in consideration of threats, e.g. from competitors. In essence, an organisation should strive to use its strengths to parry or minimize threats.
3. Mini-maxi (W/O). This combination shows the organization's weaknesses in tandem with opportunities. It is an exertion to conquer the organization's weaknesses by making the most of any new opportunities.
4. Mini-mini (W/T). This combination shows the organization's weaknesses by comparison with the current external threats. This is most definitely defensive strategy, to minimize an organization's internal weaknesses and avoid external threats.

7.2.3. Further researches

Huawei international supply chain is analyzed on its design, structure and system development principle in this research; it also involves working across multiple enterprises to shorten the supply chain time in the delivery of goods and services to the consumer or customer.

During the research period, because it was an internship in the supply chain department of Huawei Benelux many first-hand data resources were available. Therefore most of data applied in the measurement period are obtained through direct observation of day to day operation, interviews with the operational staff and end-users in Huawei, as well as department meetings, etc. These data are very valuable in measuring the current performance and construct validity; therefore the data collection on the operation analysis of this research went very well.

However, there is not enough first-hand information from the strategic side of supply chain; therefore the high-level insights from the top-managerial level should be taken into consideration more in the future researches.

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List of Definitions

Supply chain: A supply chain is the set of entities that collectively manufactures a product and sells it to an endpoint.

Strategic fit: both the competitive and supply chain strategies have the same goal.

Implied demand uncertainty: the uncertainty that exists due to the portion of demand that the supply chain is required to meet.

Build to order: a customer initiates manufacturing without going through the stages of distributor or/and retailer. Page 26

Cycle view of a supply chain: The processes in a supply chain are divided into a series of cycles, each performed at the interface between two successive stages of a supply chain.

SCOR model: The Supply-Chain Operations Reference-model (SCOR) is a process reference model that has been developed and endorsed by the Supply-Chain Council as the cross-industry standard diagnostic tool for supply-chain management. SCOR enables users to address, improve, and communicate supply-chain management practices within and between all interested parties.

Supply chain responsiveness refers to the ability of supply chain to respond to wide ranges of quantities demanded; meet short lead times; handle a large variety of products; build highly innovative products; and meet a very high service level. Increased responsiveness comes at a high cost for the supply chain.

Procurement: is the acquisition of goods and/or services at the best possible total cost of ownership, in the right quantity and quality, at the right time, in the right place for the direct benefit or use of governments, corporations, or individuals, generally via a contract.

Inventory: all raw materials, work in process, and finished goods within a supply chain.

Supply chain Flexibility: supply chain ability to respond to changes in customers demand.

Vendor Managed Inventory: a supply chain practice where the inventory is monitored, planned and managed by the vendor on behalf of the consuming organization, based on the expected demand and on previously agreed minimum and maximum inventory levels.
Safety stock: the stock level till which the dead stock or stock out situation will not arise.

Safety stock: quantity of stock held to satisfy unexpectedly high requirements in the stocking-up period.

Just-in-time: inventory system is designed to ensure that materials or supplies arrive at a facility just when they are needed so that storage and holding costs are minimized.

Crossdocking: is a process in which products is exchanged between trucks so that each truck going a customer has products from different suppliers.

List of Abbreviations

SC: Supply Chain

Huawei: Huawei technology

Huawei-NL: Huawei technology Nederlands B.V.

Benelux: The Benelux countries are Belgium, The Netherlands, and Luxembourg.

SCMD: Supply Chain Management Department

SCOR: The Supply-Chain Operations Reference-model

EU: European Union

VAT: Value Added Tax

CWI: Dutch Center for Work and Income

HR: human resource

BOM: Bill of Materials

CEG: commodity expert group

CSP: Customer Solution Procurement

VMI: Vendor Managed Inventory

JIT: Just-in-time

DC: distribution center

KPI: Key Performance Indicator

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Appendix 1

The section 4.2.3.Function of Information gathering (The choice about the type of information) is deleted, this section used to be part of section 4.2.Demand side of supply chain performance, but because information does not only exist on the Demand side but also on the Supply side, instead of putting this section separately in the section 4.2, I combined the information part with every sections which discuss drivers of supply chain performance at both demand side and supply side.

- ⁱ The value of this indicator is obtained through interview at procurement department
- ⁱⁱ The value of this indicator is obtained through interview at procurement department
- ⁱⁱⁱ Please see Appendix 2 for the backup of the figure
- ^{iv} Please see Appendix 3 for the backup of the figure
- ^v The value of this indicator is obtained from observations at DHL warehouse
- ^{vi} Please see Appendix 4 for the backup of the figure
- ^{vii} The value of this indicator is obtained through interview at logistic department
- ^{viii} Please see Appendix 5 for the backup of the figure
- ^{ix} Please see Appendix 2 for the backup of the figure
- ^x Please see Appendix 2 for the backup of the figure
- ^{xi} The result of the first two indicator is obtain through interview at supply chain department
- ^{xii} The result of the first two indicator is obtain through interview at finance department
- ^{xiii} Please see Appendix 6 for the backup of the figure
- ^{xiv} Please see Appendix 6 for the backup of the figure
- ^{xv} Please see Appendix 7 for the backup of the figure
- ^{xvi} Please see Appendix 8 for the backup of the figure