Key Factors and Key Obstacles in Global Supply Chain Management

A Study in Demand Planning Process

Wei Mengdi
Liu Yang

2013.11.29

Supervisor: Muhammad Abid
Examiner: Robin von Haartman

Master thesis, 15 Credits
Supply Chain Management
Logistics and Innovation Management
Abstract

In Recent years, global supply chain management has been a popular study area due to the economic globalization. This study mainly focus on the demand planning process of demand management in global supply chain management. The purpose of this thesis is to find the key factors and obstacles in demand planning process both in theory and practice, and solutions for the obstacles. Based on many scholar researches, a brief introduction of demand management and demand planning has been made at the beginning of the theoretical framework. Key factors, key obstacles and solutions are collected and clarified from empirical study and scholar researches in the theoretical framework. Qualitative approach is adopted as basic approach. We use case study to do the research and interviews to collect data. A server manufacturer of IBM named ISTC (International System Technology Corporation) is chosen as a case for this research. The key factors, obstacles and improvements of empirical study are compared with the facts of ISTC. New factors, obstacles and their new descriptions are figured out through the comparison between theory and the fact of the case. A suggestion for improvement and solution for the demand planning process is also put forward based on the empirical study and the facts of ISTC by this method.

Key words: Supply chain; Demand planning process; Key factors; Key obstacles
Content

Introduction ......................................................................................................................... 1
  Background ..................................................................................................................... 1
  Research Purpose ........................................................................................................... 1
  Value of this Research ................................................................................................... 2
Theoretical Framework ..................................................................................................... 3
  Globalization and Supply chain management .............................................................. 3
  Demand Management and Demand Planning ............................................................. 6
  Key Factors and Obstacles ........................................................................................... 10
Methodology ..................................................................................................................... 19
  Qualitative Approach vs. Quantitative Approach ....................................................... 19
  Research Strategy ......................................................................................................... 20
  Data Collection .............................................................................................................. 22
  Literature review .......................................................................................................... 25
  Data Analysis Process ................................................................................................... 26
  Research Quality .......................................................................................................... 27
  Limitation ...................................................................................................................... 28
Findings ............................................................................................................................ 29
  Company and Industry Introduction ............................................................................ 29
  Demand planning status ............................................................................................... 31
  Success Factors ........................................................................................................... 34
  Difficulties and challenges ........................................................................................... 37
  Improvements and Solutions ....................................................................................... 40
Analysis and Discussion ................................................................................................ 42
  Demand planning process ............................................................................................ 42
  Key Factors ................................................................................................................... 43
  Key obstacles ................................................................................................................ 48
  Improvements and Solutions ....................................................................................... 51
Conclusion ......................................................................................................................... 54
  Theoretical Contributions ............................................................................................ 55
  Managerial Implications ............................................................................................... 55
  Limitation and Further Study ....................................................................................... 55
Reference: ......................................................................................................................... 56
Notions
AG: Americas
AP: Asia Pacific
CSCMP: Council of Supply Chain Management Professionals
DM: data modeling
EMEA: Middle East and Africa
GSCF: Global Supply Chain Forum
GSCM: Global Supply Chain Management
ISTC: The Great Wall International System Technology Corporation Ltd.
MAPICS: Manufacturing, Accounting and Production Information Control Systems
MRP: Material Requirements Planning
PBC: Personal Business Commitment Plan
SAP: Systems Applications and Products in Data Processing
SCM: Supply Chain Management
**Introduction**

**Background**

As information technology is booming, we are in a new age in history—“information” age, and economic globalization is becoming the main trend in the 21st century. The trend and state of economic development will lead to the increasing global business. Company may sell, or purchase, or compete globally. Besides, transnational corporations grow fast in order to maximize advantages offered by different countries. For example, China becomes the biggest manufacturing base globally.

However, booming information and rapidly updated techniques also increase the pressure while bringing large opportunities at the same time. In order to keep positions in market, companies have to be more flexible, while developing new product, improving product quality, reducing costs, and satisfying diversity needs of customers. Hence, the effective management of supply chain is important, especially for traditional manufacturing companies. By connecting industry, business and customers, supply chain management plays a key role in company operation.

Demand management has become an important element in global supply chain management because it will provide the knowledge of what customers want and how many they require. Especially, demand planning enjoys significant attention as a tool to manage integrated business processes (Vlckova & Patak, 2011). Demand planning, as defined by Menzter et al. (2007), is coordinating the demand of goods and the demand of needed materials, and demand planning process is the process used to do demand planning. Demand planning with “high quality” could improve safety stock level, service level, purchasing and procurement, as well as reduce related costs (Wang, 2011). It calls for the connection among each component in supply chain, which will be important for reducing cost as a whole, and improving supply chain competitiveness. How to make a demand plan effective and efficient, or so-called “high quality”? The factors and obstacles during demand planning process are what going to be explored in this research.

**Research Purpose**

This thesis is focused on demand planning process in the global supply chain of the manufacturing industry. Main effort is put on figuring out the key factors and obstacles during the process, in order to improve the management of demand planning. The purpose of this thesis is to find the key factors and obstacles in demand planning process both in theory and practice, and solutions for the obstacles. Hence, the research questions are:

- What are key factors and obstacles in the demand planning process in the server
What are the possible solutions to avoid key obstacles when make a demand plan in the server manufacturing industry?

In order to answer the questions, we will review the general sense of demand planning in global supply chain, as well as the key factors and obstacles proposed in literatures. Interviews to a case company are conducted to verify the results we get from literature review in practice. The case company is The Great Wall International System Technology Corporation Ltd. Our research is in the manufacturing industry, and so is the case company. Possible solutions will be proposed according to the analysis.

**Value of this Research**

This research will contribute to demand planning in global manufacturing industry from many ways. The most important one is that it systematically analysis the key factors and obstacles in demand planning process which few has been done before. It looks in-depth into demand planning. Besides, the key factors and obstacles found can help researchers and managers to understand and evaluate demand planning better. None previous study is similar in this area. Additionally, the solutions proposed could be used by managers to improve their demand planning process. All in all, this research offers researchers of detailed information in demand planning, which will be beneficial for further studies in this area; in practical, it also helps managers to enhance the ability to make demand plan and manage demand along the global supply chain.
Theoretical Framework

In order to understand the area better and answer the research questions, numerous books and articles are searched and read. Useful information is listed one by one here. Globalization and supply chain management is introduced as the whole study is under this area. Demand planning is an element in demand management, which is an important part of supply chain management. As a result, demand planning is displayed following demand management. Then is the main part, key factors and key obstacles, including improvement and solutions based on them.

Globalization and Supply chain management

· Globalization

According to Clark et al (2003), globalization is the process by which economic, political, cultural, social, and other relevant systems of nations are integrating into World Systems. A World System is a planet-wide complex of channels capable of transmitting stimuli simultaneously to many locations at wide geographic distances (Clark et al 2003). According to Mentzer et al (2001), corporations have turned increasingly to global sources for their supplies. They stated that the globalization of supply has forced companies to find out more effective methods to coordinate the flow of materials into and out of the company, and companies in particular and supply chains in general have competed more on the basis of time and quality (Mentzer et al 2001).

· Supply chain management

According to Mentzer et al (2006), SCM is a manageable process that deals with inbound and outbound flows, from the perspective of the focal organization, its suppliers, and its customers (Mentzer et al 2006). The word supply chain management (SCM) has become such a “hot topic” that it is difficult to pick up a periodical on manufacturing, distribution, marketing, customer management, or transportation without seeing an article about SCM-related topics (Mentzer et al, 2006). Supply chain management has received attention since the early 1980s, yet conceptually the management of supply chains is not particularly well-understood, and many authors have highlighted the necessity of clear definitional constructs and conceptual frameworks on supply chain management (Croom et al, 2000). Numerous researches have been conducted in the area of supply chain management. Saunders (1995) claims that “external chain is the total chain of exchange from original source of raw material, through the various firms involved in extracting and processing raw materials, manufacturing, assembling, distributing and retailing to ultimate end customers” (Croom et al, 2000, pp.69). According to the Council of Supply Chain Management Professionals (CSCMP), planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management
activities are encompassed in supply chain management. It also encompasses the coordination and collaboration with suppliers, third-party service providers, and customers.

Lambert and Cooper (2000) divide supply chain management into three components, shown as Figure 1: supply chain business process; supply chain network structure; supply chain management components. He also put forward a framework for supply chain management as Figure 2 shown. According to Lambert and Cooper (2000), the key supply chain processes identified by members of The GSCF are: Customer relationship management; Customer service management; Demand management; Order fulfillment; Manufacturing flow management; Procurement; Product development and commercialization; Returns. Lambert and Cooper (2000) suggest that the three primary aspects of a company's network structure are: (1) the members of the supply chain, (2) the structural dimensions of the network, and (3) the different types of process links across the supply chain. Each issue is now addressed. The components in supply chain management are: Planning and control; Organizational structure; Product flow facility structure; Management methods; Power and leadership structure; Culture and attitude; Information flow facility structure; Work structures.

Figure 1 Supply chain management framework
Source: Lambert and Cooper, 2000
Global Supply Chain Management

The last decades of the twentieth century witnessed a considerable expansion of supply chains into international locations (Taylor, 1997; Dornier et al., 1998). Even though market grows and outsourcing cuts costs greatly, globalization brings benefits to companies as well as pressures, efficiency, diversity of customer needs etc. (Kluyer, 2010). The global orientation and increased performance-based competition, combined with rapidly changing technology and economic conditions, all contribute to marketplace uncertainty. This uncertainty requires greater flexibility on the part of individual companies and supply chains, which in turn demands more flexibility in supply chain relationships. Meixell et al (2005, pp.532) state:

“This growth in globalization, and the additional management challenges it brings, has motivated both practitioner and academic interest in global supply chain management”.

Supply chain management is not just a domestic phenomenon—supply chains transcend national boundaries, imposing the challenges of globalization on managers who design supply chains for existing and new product lines (Meixell & Gargeya, 2005).

Many companies today either sources globally, sells globally, or competes with some company that does. And, global supply chain management (GSCM) represents a central area of focus for many businesses and business schools today (Mentzer et al, 2006). The fierce competition in today’s markets is led by advances in industrial technology, increased globalization of demand and supply sources, tremendous
improvements in information availability, plentiful venture capital, and creative business designs (Bovet and Sheffi 1998). In highly competitive markets, the simple pursuit of market share is no longer sufficient to ensure profitability, and thus, companies focus on redefining their competitive space or profit zone (Bovet and Sheffi, 1998).

As globalization moves on, global supply chain management is a core business process of the excessive strategies importance and all corporations have to manage it as such (Kouvelis & Su, 2008). As Kluyver (2010) puts it, the companies with global business must have the capability to adapt their supply chain networks as markets or strategies change. Global supply chain management, short for GSCM, considers all the companies involved in managing the global supply chain more than just the cost and profit goals of the focal organization (Mentzer et al., 2006). Global configurations of firms provide access to cheap labor and raw materials, better financing opportunities, larger product markets, arbitrage opportunities, and additional inducements offered by host governments to attract foreign capital (AlHashim, 1980; Kogut and Kulatilaka, 1994).

**Demand Management and Demand Planning**

- **Demand Management**

As referred in figure 2, demand management is one of the supply chain business processes. According to Larambert and Cooper (2000), the demand management process is to pursue a balance within the customer’s requirements and the firm’s supply capabilities. Mentzer et al. (2007, pp. 68) give its definition as “the creation across the supply chain and its markets of a coordinated flow of demand”. To their point of view, demand management helps the traditional marketing functions, at the same time, coordinating marketing activities with other functions which the company and the supply chain contain. Croxton (2001) claims that a good demand management process can encourage a company to be more active to deal with anticipated demand unanticipated demand. It impacts every aspect of supply chain management as well as the business bottom-line (Ashayeri & Lemmes, 2005). Departments of sales, marketing, financing, manufacturing, as well as customers all need to receive and offer information. It works as a leader driving the operation of every portion in the supply chain, covering the whole flow of goods, technology, information or service from supplier to customer. Through managing demand effectively, managers could reduce the cost, speed up the fund turnover and improve the operation quality. According to Lambert and Polten (2001), demand management could impact the financial performance of a firm, for instants, sales, cost, inventory investment, fixed assets, total expense, and other current assets.

Crum et al. (2003) propose a broad-view model of demand management having four important steps, one of which is demand planning (shown in figure 3). The elements
are: planning demand, which we are going to discuss later; communicating demand, including communicating the demand plan to other parts in supply chain; influencing demand, contains efforts such as marketing and pricing; managing and prioritizing demand, to make supply match to customer order.

Figure 3 Demand Management Process Model
Sourced: Crum et al, 2003

Crum is not the only one who states it. Mentzer and Moon (2004) claim that demand management in global supply chain includes three parts, which are demand management, demand planning and sales forecasting management, as illustrated in figure 4. Menzter et al. (2007, pp.67) defines demand planning as “coordinated flow of derived and dependent demand through companies in the supply chain”. Dependent demand, according to them, is the demand for components needed in making products, while independent demand is referred as the demand from end-users. Derived demand is the dependent demand of company up-stream in supply chain, because its demand is derived from other companies. Supply chain relationship management encourage supply chain partners to help manage the demand flow and get overall success through supply chain by fairly rewarded each one. However, sales forecasting management cares the independent demand occurred, which could be seen as a preparation step for demand planning.
Figure 4 Demand Management in Supply Chain  
Source: Menter et al., 2007

- **Demand Planning**

Menzter et al. (2007) state that demand planning is an important part of demand management, which is the only one having relationships with the other two parts: marketing/supply chain relationship management and sales forecasting management, shown like figure 3. The result of demand planning is always treated as sales and operation plans. Demand planning is much more than forecasting. Demand planning moves ahead of pure demand forecasting by adding exceptional influences those are much likely to happen in the future as well as their impact on sales to the formal demand forecasts (Stadtler, 2005). According to Wagner (2006), demand planning contains three parts: forecasting, what-if analysis and safety stock calculations. Forecasting aims at producing future demand prediction and what-if analysis is a tool used to decide safety stock level. Lee (2001) claimed that demand planning as a critical businesses process could impact the whole supply chain management as well as the business bottom-line. Kristianto et al. (2010) states it can influence product and material price through capacity decision, and manufacturing strategy by take lead-time, inventory together with demand fulfillment into consideration.

Due to the Bullwhip Effect, forecasts grow larger and larger along up-stream supply chain, which would result in larger safe-stock and customer orders, as well as increasing the cost of the whole supply chain. That is why demand planning is needed. Through planning demand cooperating to other portions in supply chain, the Bullwhip
Effect could be reduced, and both financial and non-financial performance of SC could be improved (Ashayeri & Lemmes, 2005). Crum and Palmatier (2003, pp.27) claim demand planning is useful in three ways:

“1. Validating that the product, marketing, and selling plans and strategies will deliver the expected financial and market positioning results;
2. Determining the resources required to produce, transport, and deliver product to consumers;
3. Developing financial projections of sales revenues, cash flow, and profit margins”

The ever-increasing trend in globalization of business has also made the demand planning and management more complex due to the fact that the markets are becoming progressively more unpredictable, fragmented, and dynamic (Ashayeri et al 2006). As Ashayeri et al (2006) state, the importance of demand planning for supply chain management is increasing these years. And the challenge of demand management is to identify market dynamics in advance (Ashayeri et al 2006). In supply chains, higher accuracy performance measures require more rigorous planning of demand (Ashayeri et al 2006).

- Demand planning process

The task for planning is to support “the material flow across a supply chain and related business functions” (Stadtler, 2005, pp.582). There are many types of planning in supply chain management, for instants, strategic network planning, master planning, material requirements planning and demand planning (Meyr et al., 2002). Since SCM driven by demand, demand planning could be the start point (Stadtler, 2005). More generally, demand planning is to make a demand plan. But, how demand plan is worked out? There are some steps suggested for us to follow, which is the demand planning process. According to Crum et al (2003), demand planning process is a process of planning demands for products or services to support the marketplace, which includes the necessary methods, techniques, tools, etc. Compared to demand planning, which tells what to do, demand planning process focus on how to do. This process involves updating the products, brand, marketing, and sales plans and assumptions each month and reaching consensus on an updated demand plan (Crum & Palmatier, 2003).

Zinnert (2010) claims that long term demand forecasts interrelate with organizational functions, apart from production processes, such as Marketing and Human Resources as promotional activities need to be planned as well as personnel aligned. It is imperative for successful SCM to integrate all areas affected by the demand planning into the forecasting process on the GSCM as well as on the external SCM level (Zinnert, 2010). Therefore, Zinnert (2010) stated that it is crucial to the quality of the forecast to build a structured demand planning process.
In the book of Crum et al (2003), a best practice demand planning process has been put forward as shown in figure 5. As you can see, the demand plan is based on multiple inputs—from the sale, marketing, and product management organizations as well as statistical analysis. The book also introduces a most frequently used statistical forecasting method called the times series technique. “It uses historical data sequenced by time (days, weeks, months, etc.) and projects future demand by the same time sequence” (Crum & Palmatier, 2003, pp.64). It is a component of the statistical analysis process for supporting demand planning.

![Figure 5 Demand Planning Process](image)

**Figure 5 Demand Planning Process**
*Source: Crumed et al, 2003*

**Key Factors and Obstacles**

- **Key Factors**

  Mintzer et al (2006) explain the factors for global supply chain management from the perspective of different management components; namely, dynamic demand, process innovation and the relationship with supply chain partners. Lu et al. (2011) examine the KSFs (Key Successful Factor) in two hierarchies, implementation and operation phrase and each hierarchy has four levels: strategy, process, organization/partnership and technical.

  Yu et al (2001) illustrate the benefits of supply chain partners on information sharing. They use a decentralized supply chain consisting of a single retailer and a single
manufacturer to model the partnership. The bullwhip effect will be reduced through good relationship within supply chain partners in the supply chain process. As one part of supply chain management, demand management also relies on a good relationship with supply chain management. According to Vlckova et al (2011), the importance of demand planning is growing mainly with regard to increasing importance of the relationship with different supply chain partners. Vlckova et al (2011) do their research in chosen companies of food and chemical industry in the Czech Republic revealed the key issues of demand planning implementation in these companies. One of the key factors they figure out is confidence between individual links of supply chain and their willingness to cooperate in the field of information sharing about demands and sales. It is important to keep a good relationship with supply chain partners. Min et al (2004) introduce CPFR (collaborative planning, forecasting and replenishment) and compare it with the other alternative forecasting techniques such as agent-based forecasting and focus forecasting. They stress the value of information sharing among supply chain partners, i.e. collaborative planning. According to Min et al (2004), a growing numbers of companies have recognized the importance of relationship with supply chain partners for the value of information sharing. Numerous companies also expressed great interest in jointly creating customers demand, managing business functions and leveraging the strength of their supply chain partners. Poorly coordinated data exchange or information sharing among supply chain partners has been one of main reasons for a lack of success in implementing supply chain integration (Min et al 2004). Dudek et al (2005) laid out a negotiation-based scheme for collaborative planning between two partners in their study. They stress that both buyer and supplier should realize benefits through the scheme. Then the company will get good relationship with these two partners by this scheme indirectly.

Crum (2003) clarifies the definition between plan and forecast in Webster’s: Forecast: To predict a future condition or occurrence; Plan: A scheme or method of acting, doing, proceeding, making etc., developed in advance. Zinnert (2010) claims that demand forecasting is important to demand planning. Karimi et al (2001) use the data gathered from a survey of 213 IT-leaders in the financial services industry to do their research. The purpose of research is to gauge whether IT management practices differ among firms where IT has a major role in transforming marketing, operations, or both, which give the firms advantage by affecting their customer service. According to Karimi et al (2001), the implementation of information technology has given many companies transforming advantage in marketing, operations, or both by demand management. The companies can leverage the information technologies such as database information and supplier pipeline processes to forecast demand more accurately and create valuable scheduling applications. The implementation of IT (Information Technology) in the supply chain can enable a firm to develop and accumulate knowledge stores about its customers, suppliers, and market demands, which in turn influences firm performance (Tippins et al, 2003).

Frohlich (2002) states that a web-based technology now permits the upstream as well
as downstream supply chain integration in demand forecasting area. Yao et al (2003) claims that numerous researchers have studied the electric load forecasting since the 1960s. They stated that the researchers have developed various forecasting models to investigate the forecasting of electric power load, such as time-series, regression analysis and artificial intelligence. An online electricity demand predictor was also put forward. Chen et al. (2000) investigated the impact of forecast methods and demand patterns on the bullwhip effect. They found that the suitable forecasting models could decrease the bullwhip effect. Zhao et al. (1995) found that using different forecasting models resulted in different bias and standard deviations of forecasting errors and the forecasting errors often have a significant impact on the relative performance of demand planning. Zhao et al. (2002) use a computer simulation model to examine demand forecasting and inventory replenishment decisions by the retailers, and production decisions by the supplier under different demand patterns and capacity tightness. “The selection of forecasting model can significantly influence the performance of a production and inventory system” (Zhao et al, 2002). Then it will influence the performance of demand planning. Understanding how a forecasting model influences demand planning performance can help firms selecting better forecasting model to decrease the negative impact of forecasting errors (Zhao et al, 2002).

Zhao et al (2002) also states that high quantity and accurate input data are important in using forecasting models. Crum et al (2003) introduces one of most frequently used statistical forecasting method called the times series technique. This model uses historical data sequenced by time (days, weeks, months, etc.) and projects future demand by the same time sequence (Crum et al, 2003). One of this model’s advantages is to use the accurate historical data which decrease the bias of human judgment. According to Crum et al (2003), the accuracy’s degree of times series statistical forecasting method relies on the historical data. “To accurately predict variability in demand, such as seasonal patterns, the times series statistical forecasting method is usually most accurate when there are 24 to 36 historical data periods upon which to base the future forecast” (pp 29). We can see that high quality and more accurate input data will improve the process of demand forecasting. Then it will be helpful to demand planning process. Thomas (2013) introduces the importance of data in competing on analytic by the example like Amazon, Harrah’s, Capital one etc. According to Thomas (2013), many companies have realized the importance of data and try to improve the quantity and quality of data which should put into the system to reduce the bias and improve the accuracy.

According to Frohlich (2002), information communication in the supply chain can reduce demand uncertainty, and the cost of inventories in the process of matching supply with demand in the supply chain network (Frohlich, 2002). Zinnert (2010) claims that one of important steps for demand planning is to collect and integrate the relevant information inside the company. Vlckova et al (2011) do their research in chosen companies of food and chemical industry in the Czech Republic revealed the key issues of demand planning implementation in these companies. According to
Vlckova et al (2011), information systems play a key role in demand planning. It is important to make sure the information communication inside the company can be managed well. Lambert (2006) states that internal communication is crucial in the whole supply chain, especially the operational customer service process. This way can identify potential obstacles timely for fulfilling customers’ requirement. Lambert (2006) claims that several expenses can be reduced by improved planning and communication: “reducing returns, order processing and transaction cost; minimizing or eliminating claims; improved management of warranty, replacement, and repair programs; and reducing the number of expedited shipments”(pp 79).

In the Global Supply Chain Management Forum (2005), the case of TOYOTA demand chain management has been analyzed and demand planning cycle has been introduced as one part of demand chain management. In TOYOTA, there are three types of planning cycles — monthly, weekly, daily. The choice of these three types of planning cycles depends on the orders that they collected from their customers. It claims that demand planning cycle should be set in different situations for the cost of inventory. Marshall et al (1994) states that the reduction in cycle time offers the potential to reduce the cost of stock outs and markdowns by allowing production decisions to be differed until more information and better forecast available. Their study shows that the uncertainty of customers’ demand is changing thanks to the globalization. They try to figure out some methods to solve the problem. One on the methods is to control the planning cycles of the enterprises.

We have collected about five key factors in demand planning above. They can be shown in table 1.

<table>
<thead>
<tr>
<th>Key Factors</th>
<th>Description</th>
<th>Publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relationship with Supply Chain Partners</td>
<td>Good relationship will be good for the data exchange and information sharing between supply chain partners and company.</td>
<td>Yu et al (2001); Min et al. (2004); Vlckova et al. (2011); Dudek et al (2005)</td>
</tr>
<tr>
<td>Information Technologies and Forecasting Model</td>
<td>The companies can leverage the information technologies to forecast demand more accurately and create valuable scheduling applications. The selection of forecasting models can influence the performance of a production and inventory system and decrease bullwhip effect.</td>
<td>Karimi et al. (2001); Tippins &amp; Sohi, (2003); Yao et al (2003); Chen et al. (2000); Zhao et al. (1995); Zhao et al. (2002); Frohlich (2002)</td>
</tr>
<tr>
<td>The Quality of Input Data</td>
<td>Accurate and Latest input data will improve the process of demand forecasting.</td>
<td>Zhao et al (2002); Crum et al (2003); Thomas (2013)</td>
</tr>
</tbody>
</table>
Information Communication within Corporation

Good information communication within corporation can reduce demand uncertainty, cost and important to information systems.

Frohlich, (2002); Zinnert (2010); Vlckova et al (2011); Lambert (2006)

Demand Planning Cycle

Reduction in cycle time offers the potential to reduce the cast of stock outs and markdowns by allowing production decisions to be differed until more information and better forecast available.


Table 1 Key factors

Key Obstacles

Besides the key factors, there are also the key obstacles, which are mostly referred as risks in demand planning. Risks are defined as threats that can influence the value the stakeholders or owners have in the business (Manuj et al, 2006). Hence, obstacles in demand planning process are the threats that would lead to the failure of making a demand plan with high efficiency.

These years, the business environment is changing rapidly. Volatile circumstance, or so called market dynamic, drives increasing product variety and demand uncertainty (Traxler et al, 2012). Demand uncertainty is associated to whether the demand for product is predictability (Lee, 2002). According to Ashayeri et al (2006), identification of market dynamic in advance is a challenge in demand planning. In the opinion of Ashayeri et al (2006), higher accuracy performance measures require stricter planning of demand that will impact the supply chain management. Moreover, the accurate identification of market dynamic in advance will improve the reliability of demand planning in supply chain management. According to Lee (2002), the prediction would be simple if there is only one product provider to a single customer. Unfortunately, it is not in practice. Various products and several hundreds or thousands of individual customers need to be taken into consideration (Sodhi, 2005).

Changing business environment makes things worse. As globalization goes on, the need to face demand uncertainty is growing at the same time. Uncertainty demand is a main reason to make the forecasting harder, even lead to the complete failure in the end (Gupta & Maranas, 2003). As forecasting is an important element of demand planning, the result of uncertainty demand would be fatal. Traxler et al. (2012) carry out a company-specific case study to show how demand uncertainty caused by the changing environment influence demand planning process. Within the sales department of the case company, prediction used to involves just a certain number of one specific type of product. The result is accurate, but only suitable for the certain type of product. But, as demand uncertainty increased, the old demand planning system is not adequate. Moreover, they propose adaptive logic to improve the demand planning process. Nielsen & Stager-Jensen (2007) make an experiment on three
different products in manufacturing industry, and the result shows product with higher demand diversity will lead to a poorer demand planning performance. Hence, market dynamic is indeed an obstacle for demand planning, and it cannot be controlled by company, even though it does bring more commercial opportunities. A good prediction tool or demand planning system with high flexibility would be used to reduce its adverse effect.

Beside demand resource, information sharing is the other important aspect in demand planning process as well as in supply chain management (Samuel, 2010). The information shared can be inventory level, sales data, order tracking, sales forecasting, etc (Lee & Whang, 2000). Sarma & Yen (2007, pp. 159) state “demand planning is done based on collaborative planning, forecasting and replenishment (CPFR) model”. It calls for the coordination throughout the supply chain (Moon et al, 2000). Samuel (2010) conducts three case studies to look insight the relationship between collaboration and demand planning process. The result shows as demand planning goes on, the deeper of collaboration and more information sharing is needed (Figure 6). The following three obstacles are all about information sharing during demand planning process.

As Faisal et al. (2007, pp. 680) claim, information system security/ break is an important obstacle in demand planning, because “any breakdown or security breach in the information system would be critical for the whole network”. Security risk means the threat caused by unknown third party to steal information or knowledge, or disable a firm’s operation (Manuj et al., 2007). Through conducting a survey for more than 100 companies in manufacturing industry, Thompson and William (1997) get the conclusion that using information system could greatly improved the quality of planning, help it to be more effective and efficient. In order to make a demand plan, several software packages may be used, for making decision, collecting data, and analysis data, which make the whole system complex (Stadtler, 2005). As demand
planning is very dependent on the information system, the security of information system could not be ignored. Siponen (2000) studies the previous researches and highlights information system with good security could ensure the information available, safety and integrity. No matter information system shut down or data loss will let demand planning process suffer a lot (Sheff, 2005). Faisal et al. (2007) state some comment events that threat information system: (1) Hakers, viruses and worms; (2) Spyware; (3) Internal employee fraud; (4) Distributed denial of service attacks; (5) Nature disasters and terrorist attacks.

Another obstacle is database diversity. Kappauf et al. (2011) highlight demand planning is done while all partners work in one database. Database, according to Baklauf & Stair (2009, pp. 655), is “a collection of integrated and related files; a collection of data organized collection of facts and information”. Reuter & Rohde (2008) claim a single database will be beneficial for avoiding inconsistencies and redundancies of the planning data. Samuel (2010) also mention using more databases will lead to poor performance of demand planning. However, as Crum & Plamatier (2003) state, different companies have different tools to make demand plan, each of which utilize a database. In databases, category and sequence of data differ from one to another (Reuter & Rohde, 2008). For example, the data in one database is horizontal, so it usually cannot be read in another database where data is vertically arranged; transfer a data categorized as six types to a database where data only have five types will cause overflow, and in reverse redundancy will occur. Vlkova & Patak (2011) conduct a study of four case companies, and the result support that no integrated information system is a barrier in demand planning.

The last one is bullwhip effect, which is “the increasing amplification of orders occurring within a supply chain the more one moves upstream” (Stadtler, 2006, pp.27). Lee et al. (1997a) get bullwhip effect through mathematical derivation, and explain multiple demand forecasting is an important factor to cause bullwhip effect. Then use cases and industry data to examine it in their later research (Lee et al., 1997b) Menzter et al. (2007), as well as Stadtler (2006), give examples to demonstrate how bullwhip effect lead to demand error in supply chain, and how it affects the safety stock for up-stream companies. Besides, based on Menzter et al. (2007), there is a paradox of demand planning in the supply chain, that is, the one most needed to do demand planning, have the least economic motivation, for instant, the retailers. Hence, to those who stand in the up-stream of supply chain (i.e., suppliers and manufacturers), bullwhip effect is hard to eliminate. Good information transmission would be benefit for restrain the bullwhip effect, but the willing to share information is not just a technique problem (Stadtler, 2004). Sarma & Yen (2007) also suggest the bullwhip effect would be reduced if all components in the supply chain can coordinate better and avoid multiple forecasting. Lee & Whang (2000) give example of some companies, such as Procter & Gamble and IBM, of how they deal with this problem.

The key obstacles are summarized below, in table 2:
Table 2 Key Obstacles

<table>
<thead>
<tr>
<th>Key obstacle</th>
<th>Description</th>
<th>Publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information system security/ breakdown</td>
<td>The methodologies and processes involved to keep information available, safety and integrity</td>
<td>Faisal et al. 2007&lt;br&gt;Thompson &amp; William, 1997&lt;br&gt;Stadtler, 2005&lt;br&gt;Siponen, 2000&lt;br&gt;Manuj et al., 2007&lt;br&gt;Sheffi, 2005</td>
</tr>
<tr>
<td>Database diversity</td>
<td>Different database will lead to different data forms which cannot be recognized from one another</td>
<td>Kappauf et al. 2011&lt;br&gt;Crum &amp; Plamatier, 2003&lt;br&gt;Reuter &amp; Rohde, 2008&lt;br&gt;Samuel, 2010&lt;br&gt;Vlckova &amp; Patak, 2011</td>
</tr>
<tr>
<td>Bullwhip Effect</td>
<td>Inaccurate date from end-user caused in loss of suppliers</td>
<td>Stadtler, 2006&lt;br&gt;Lee et al., 1997a&lt;br&gt;Lee et al., 1997b&lt;br&gt;Lee &amp; Whang, 2000&lt;br&gt;Menzter et al., 2007&lt;br&gt;Stadtler, 2004&lt;br&gt;Sarma &amp; Yen, 2007</td>
</tr>
</tbody>
</table>

• **Improvements and solutions**

According to Min et al (2004), CPFR (collaborative planning, forecasting and replenishment) is introduced and compared with the other alternative forecasting techniques such as agent-based forecasting and focus forecasting. Min et al (2004) claims that CPFR has been proven to be successful in minimizing safety stocks, improving order fill rates, increasing sales, and reducing customer response time. It will ensure the good relationship with supply partners. Chen et al. (2000) investigated the impact of forecast methods and demand patterns on the bullwhip effect. They stress that the suitable forecasting models could decrease the bullwhip effect. Crum et
al (2003) introduces one of most frequently used statistical forecasting method called the times series technique. This model uses historical data sequenced by time (days, weeks, months, etc.) and projects future demand by the same time sequence. One of this model’s advantages is to use the accurate historical data which decrease the bias of human judgment. According to Vlčková et al (2011), information systems play a key role in demand planning. Zinnert (2010) claims that one of important steps for demand planning is to collect and integrate the relevant information inside the company. It is considered to be an important way for internal information communication. According to the case of TOYOTA, demand planning cycle should be set in different situations for the cost of inventory.

In order to deal with market dynamic, Traxler et al (2012) propose an adaptive logic in demand planning. The case company in the study of Marshall et al. (1994) also adopts new demand planning software to adjusting the volatile. Moon et al. (2000) claim using a sale forecasting audit will continuously improve the ability of effective demand forecasting through the study to its case company--Lucent Technologies. According to Faisal et al. (2007), using security software like firewall and authorization system are essential parts. The stable of system itself is also very important. Kappauf et al. (2011) emphasize the importance of consistent information system. Using the same system in every department could improve the speed and accuracy of data, leading to a better performance of demand planning. Sarma & Yen (2007) point out reducing multiple forecasting will help to avoid bullwhip effect. This requires a good communication system among all component in supply chain, such as suppliers and consumers. Stadtler (2004) also claims good information transmission is very beneficially for demand planning.
Methodology

Qualitative approach is adopted as the main approach to do the research, as the aim of this article is to find out the factors and obstacles, rather than caring about some specific numbers in the industry. In order to answer the research question, firstly a briefly literature review is done to identify the possible result. Then a case study is conducted to verify the result in the target industry. The case we choose has a complete system to do international demand planning in the industry. To collect data from the case company, interview was used. In this chapter, we are going to introduce qualitative and quantitative approach, research strategy, data collection including interview, data analysis framework, and potential problem of the research.

Qualitative Approach vs. Quantitative Approach

There are two research methods can be taken into practice in research, which are qualitative method and quantitative method (Ghauri & Grönhaug 2005). Whether to use quantitative or qualitative approach is purely related to the philosophical stance of the research (Croom, 2008).

• Qualitative Approach

According to Labuschagne (2003, pp.100), qualitative means:

“...an emphasis on processes and meaning that are rigorously examined, but not measured in terms of quantity, amount or frequency”.

Qualitative approach is a set of interpretive activities, including multiple methods and strategies, and used in many separate disciplines (Denzin & Lincoln, 2011). According to Denzin and Lincoln (2011), qualitative approach relies on why and how of various behavior, more than just investigate what, where, and when. As Murry and Hughes (2008) maintain, qualitative is collecting information and analyzing it, focusing more on dept of data rather than numbers. Labuschagne (2003) introduce qualitative approach is more concentrate on the nature, for example, the state, properties and character, of phenomena. Croom (2008) also claims it is mainly concerned with constructivism, interpretation and perception, instead of identification of a rational, objective truth.

• Quantitative Approach

On the other hand, quantitative research is a research method that is focused more on the collection and analysis of numerical data and statistics (Cooper & Schindler, 2003). Murry and Hughes (2008, pp.150) states that quantitative research is one “in which the data you collect and analyze involves the accurate measurement of phenomena and, often, the application of statistical analysis”. Labuschagne (2003) claims it is mainly concerned phenomena with certain states, characters and properties, and relationships between and among them.

Quantitative and qualitative approaches do have some similarities (Onwuegbuzie &
Leech, 2005). They propose three similarities: (1) using observation to set research question; (2) utilizing technique to verify the data; (3) data reduction. Even though, Croom (2008) claims that the differences between qualitative and quantitative approaches influence deeply on how researchers conduct the researches. According to Onwuegbuzie and Leech (2005), the difference between the two approaches represent on philosophies of each one, such as logic, ontology, and causal linkages. Mahoney and Goertz (2006) contrast qualitative approach and quantitative approach from ten aspects which regarded as especially important (as shown in table 7). They are: (1) explanation approaches; (2) causation conceptions; (3) Multivariate explanations; (4) equifinality; (5) scope and generalization; (6) case selection practices; (7) weighting observations; (8) substantively important cases; (9) lack of fit; (10) concepts and measurement.

According to the differences between qualitative and quantitative approaches, qualitative one is chosen in this these. Because the research questions focus on “what”, and the results we are going to get concern words rather than figures or numbers. Few causal paths can be used. Besides, it is hard to get exact numbers or find a certain mathematical way to calculate the factors and obstacles.

<table>
<thead>
<tr>
<th>Section</th>
<th>Criterion</th>
<th>Qualitative</th>
<th>Quantitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Approaches to explanation</td>
<td>Explain individual cases; &quot;causes-of-effects” approach</td>
<td>Estimate average effect of independent variables; &quot;effects-of-causes&quot; approach</td>
</tr>
<tr>
<td>2</td>
<td>Conceptions of causation</td>
<td>Necessary and sufficient causes; mathematical logic</td>
<td>Correlational causes; probability/statistical theory</td>
</tr>
<tr>
<td>3</td>
<td>Multivariate explanations</td>
<td>INUS causation; occasional individual effects</td>
<td>Additive causation; occasional interaction terms</td>
</tr>
<tr>
<td>4</td>
<td>Equifinality</td>
<td>Core concept; few causal paths</td>
<td>Absent concept; implicitly large number of causal paths</td>
</tr>
<tr>
<td>5</td>
<td>Scope and generalization</td>
<td>Adopt a narrow scope to avoid causal heterogeneity</td>
<td>Adopt a broad scope to maximize statistical leverage and generalization</td>
</tr>
<tr>
<td>6</td>
<td>Case selection practices</td>
<td>Oriented toward positive cases on dependent variable; no (0,0,0) cases</td>
<td>Random selection (ideally) on independent variables; all cases analyzed</td>
</tr>
<tr>
<td>7</td>
<td>Weighing observations</td>
<td>Theory evaluation sensitive to individual observations; one must can have an important impact</td>
<td>All observations are a priori equally important; overall pattern of fit is crucial</td>
</tr>
<tr>
<td>8</td>
<td>Substantively important cases</td>
<td>Substantively important cases must be explained</td>
<td>Substantively important cases not given special attention</td>
</tr>
<tr>
<td>9</td>
<td>Lack of fit</td>
<td>Nonconforming cases are examined closely and explained</td>
<td>Nonsystematic causal factors are treated as error</td>
</tr>
<tr>
<td>10</td>
<td>Concepts and measurement</td>
<td>Concepts center of attention; error leads to concept revision</td>
<td>Measurement and indicators center of attention; error is modeled and/or new indicators identified</td>
</tr>
</tbody>
</table>

Figure 7: Contrasting qualitative and quantitative research
Source: Mahoney & Goertz, 2006

Research Strategy

Research strategy is an overall plan to solve a problem, including structure, desired solution to answer research questions, and an outline of necessary methods to fulfill the strategy (Singh & Nath, 2010). In short, according to Biggam (2008), it is how you are going to complete the research study. Research strategy is important because it provides a general direction of research as well as the high level process to do the research (Singh & Nath, 2010). There are many research strategies available for choosing, such as survey, case study, grounded theory, experimental research, action research, etc. Singh & Nath (2010) highlights four key issues to determine which one
could be used: (1) research question; (2) researchers’ skills and attitude; (3) costs or budget available; (4) time available. Following these tips, case study is regarded as the most suitable one to do out research. Seuring (2005) states case study is used if contextual factors are taken into account, but the extent of analysis should be limited at the same time. Yin (2009) distinguishes the condition to use case study with other comment strategies: experiment, survey, archival, analysis and history (shown in figure 8). Three conditions should be taken into consideration: (1) forms of research question; (2) if it requires control of behavioral events or not; (3) whether to focus on contemporary events.

Because the purpose of this thesis is mainly to investigate how demand planning works, case study is adopted. Experiment is obviously unavailable for no organizations would allow us to change their existing working process. Survey cannot allow us to look into demand planning process deeply. To analysis archives has nothing to do with this research. History research are looking into phenomena happened in the history. However, as the business environment changing rapidly, history research is not reliable enough.

<table>
<thead>
<tr>
<th>METHOD</th>
<th>(1) Form of Research Question</th>
<th>(2) Requires Control of Behavioral Events?</th>
<th>(3) Focuses on Contemporary Events?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>how, why?</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Survey</td>
<td>who, what, where, how many, how much?</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Archival Analysis</td>
<td>who, what, where, how many, how much?</td>
<td>no</td>
<td>yes/no</td>
</tr>
<tr>
<td>History</td>
<td>how, why?</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td><strong>Case Study</strong></td>
<td>how, why?</td>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>

*Figure 8 Relevant Situations for Different Research Methods
Source: Yin, 2009*

**Case study**

Case study is a useful way for empirical research in supply chain management (Seuring, 2005). A case, stated by Croom (2008), is to descript an organization, incident or phenomenon in detail. The definition of case study according to Yin (2009, pp.4) is:

“A case study is a story about something unique, special, or interesting—stories can be about individuals, organizations, processes, programs, neighborhoods,
There are three types of case studies, exploratory case study, descriptive study and explanatory case study (Yin, 2009). Exploratory case study deals with “a subject that is clearly important but has been previously neglected for various reasons” (Gagnon, 2010, pp.15). Explanatory case study, according to Hartly (2004), should be the possible explanations for the accuracy features and facts of the case, and then get conclusion based on the explanations. Descriptive case study is used to describe an intervention or phenomenon, as well as its real-life context, and all result would be descriptive factors (Yin, 2003). Based on the number of organization going to be used, case study is divided in to single-case study and multiple-case study (Yin, 2003). When two or more organizations are studies in the same time, then it is a multiple-case study. On the contrast, single-case study just takes one social phenomenon into account (Xiao, 2010).

In this research, exploratory single-case study is used. Because the research aims at finding out the factors and obstacles, rather than just describing the process of demand planning or explaining relationships, the case study is exploratory. It is a single-case study for we only have one case company. Changcheng Information System Technology Corporation is selected as the case company. According to Xiao (2010), to select a case and analysis it is a major component for design a single-case study. Bleijenbergh (2010) highlights that, in an exploratory single-case study, the selected case could be giving maximal opportunities to build theories or hypotheses. This case company is chosen based on two reasons. One is that it has sells all around the world. Thanks to the globalization and low labor cost in China, IBM put many of its manufacturing departments in China. It cooperates with a Chinese company and builds ISTC, 75% stakes of which is owned by IBM. It provides servers for IBM’s customers mainly from Asia and Australia and still some from America and Europe. The other reason is it has a complete demand planning system in manufacturing industry inherited from IBM, which will be beneficial to look into demand planning process practically and do deeper study.

Data Collection

- Data types

Data collection refers to gathering relevant information on a purpose to support the study (Singh & Bajpai, 2007). The data are generally classified into two types: primary data and secondary data. Blaikie (2009) proposed another data type called tertiary data, but it is almost the same with secondary.

(1) Primary data

Primary data is the first-hand information collected and used for the first time based on your own research purpose (Singh & Bajpai, 2007; Kothari, 2004; Jain et al,
That is to say, primary data is gain from your own observation in your interested area, and what you will get depend on your research questions and research methods. It can be words or numbers. Primary data involves behavior, motivations, status and state of affairs, attitude and opinion, awareness and knowledge, and intentions (Ghauri & Grönhaug, 2005). As a result, primary data would be unique and specific for your research.

(2) Secondary data

Jain et al. (2008, pp.14) states “secondary data are those which are already in existence, and which have been collected, for some other purpose than answering of the question in hand”. That is to say, secondary data is the information collected by others for others goal. They can be both published and unpublished (Saksena, 1981). Secondary data come from two sources, according to Ghauri & Grönhaug (2005). External sources are mainly journals, books and industry reports, while internal sources are regarded as information of the case company, such as information on customers, employees, marketing plans, etc. However, as Saksena (1980) maintains, primary data and secondary data are not fixed, which means, primary data for one’s research could the secondary data for another.

To distinguish them will help us to choose proper methods of data collection (Singh & Bajpai, 2007). There are many differences between primary data and secondary data. Jain et al. (2008) claim three aspects reflecting their differences: originality, suitability of objectives and cost of collection. Singh and Bajpai (2007) states that primary data would have greater details, and be more accurate comparing to secondary data, for it is collected based on researcher’s personal aim. But it also needs more time, cost and available resources. No matter what method used, to gain primary data is not an easy work. Jain & Jhunjhunwala (2007) summary all the differences and put them into figure 9. He compares them based on 6 aspects: meaning, originality, cost, suitability, use and personal prejudice. Following these suggestions, data which will be used in the research can be classified clearly.

<table>
<thead>
<tr>
<th>Basis of Distinction</th>
<th>Primary Data</th>
<th>Secondary Data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Meaning</strong></td>
<td>Primary Data is collection of original data for the first time.</td>
<td>Secondary data is basically compilation of existing data.</td>
</tr>
<tr>
<td><strong>2. Who collects/compiles</strong></td>
<td>It is collected by the investigator or his agents.</td>
<td>It is compiled by persons other than who collected the primary data.</td>
</tr>
<tr>
<td><strong>3. Cost</strong></td>
<td>Its collection is relatively more costly.</td>
<td>Its collection is relatively less costly.</td>
</tr>
<tr>
<td><strong>4. Suitability</strong></td>
<td>It is usually directly suitable to the purpose of enquiry.</td>
<td>It may not be directly suitable to the purpose of enquiry.</td>
</tr>
<tr>
<td><strong>5. Use</strong></td>
<td>It may be used as it is for the purpose of enquiry.</td>
<td>It may require certain adjustments to be made to suit the purpose of enquiry.</td>
</tr>
<tr>
<td><strong>6. Personal prejudice</strong></td>
<td>There is possibility of personal prejudice in its collection.</td>
<td>There is no possibility of personal prejudice in its compilation since such data are already collected.</td>
</tr>
</tbody>
</table>
In this research, primary data is information we get from interviewees in the case company. Interview, as a method to collect data, will be introduced later in the chapter. Meanwhile, secondary data are some information coming from website of company, report of manufacturing industry, etc.

**Data collection method**

(1) Interview

Marshall & Rossman (2010) claims the term qualitative research typically relies on four methods for gathering information: (1) Participation in the setting; (2) Direct observation; (3) In-depth interviews; (4) Analysis of documents and materials. Interview is also an important method to collect primary data in case study (Kothari, 2004; Saunders et al, 2012) Interviews are often used when the researcher wants to give a deeper understanding of the study, which is a characteristic for qualitative research (Halvorsen, 1992). There are many ways to classify interview (Saunders et al, 2012). The most comment one is categorizing qualitative interview into three types: unstructured, semi structured and structured (Ghauri & Grönhaug, 2005). In unstructured interview, the questions are not determined in advance (Saunders et al, 2012). The semi structured interviews often have a developed interview guide and interviewees are free to ask questions in the meantime. When the researcher chooses to follow a schedule with predefined questions, it is a structured interview and the options for answers are fairly open. Under structured interview, a group of respondents are required. Gillham (2000) conclude them detailed into figure 10.

![Figure 10 Interview dimension](source: Gillham, 2000)

As Saunders et al. (2012) state, which structure will be used is based on four situations: (1) the research purpose; (2) the significance of establishing personal research; (3) the nature of data collection questions; (4) length of time required and completeness of the process. In their theory, semi-structured interview is best for explanatory research. According to Bloom & Crabtree (2006), semi structured in-depth interview is used most widely in qualitative research to both individual and group. Biggam (2008) also claims thanks to open-ended questions, using semi-structure can encourage interviewees to give meaningful responds. Kothari (2004) argues structured interview is beneficial for descriptive studies while in exploratory study, unstructured
As the research strategy is an explanatory case study, semi structured interview is adopted. We prepare questions about what we want to know from interviewees in advance, without certain answers. In order to make the interview more reliable, we have four interviewees: manager of demand planning department in case company and assistant manager, and two employees. The questions mainly involve the factors and obstacles they meet in demand planning process or think based on their working experience. For the two managers, we prepare extra questions about the general information of company and the demand planning process. It is worth to note that there are two way to conduct interview (Kothari, 2004). One is personal interview, which means doing the interview face-to-face. The other is telephone and electronic interview, thus, use telephone, or even e-mail or other remote charting tools (i.e. QQ, Skype) accessing to interviewees. As our case company is a Chinese company, the second one is selected. We connect two managers mainly through telephone and e-mails, while video calls through charting tool (QQ) are used to connect with the two employees.

**Literature review**

Ridly (2012, pp.3) defines literature review as:

‘‘...the part of the thesis where there is extensive reference to related research and theory in your field; it is where connections are made between the source texts that you draw on and where you position yourself and your research among these sources... You can use the literature to support your identification of a problem to research and to illustrate that there is a gap in previous research which needs to fulfill.’’

According to Saunders et al. (2012), the critical review of literature provides foundation for the research. Through gathering information from relevant previous studies and researches, you will have a better understanding on your topic and where could be your contribution (Oliver, 2012). Ridly (2012) highlights multiple purposes of literature review, for example, providing historical background and supporting evidence for your research and research questions. Walliam (2005) also state that as literature review is so important, collecting more resource will help you organize research better, even though it will probably take many months. Information in literature review is mainly from journals, magazines and books (Badke, 2011) Using database is a quick way to seek for sources. In this research, literature review is very important. Not only because it offers a general background of our topic, but also a conclusion will be get from comparison between theory and our findings.

We organize the literature review based on the theoretical frame work by Mentzer et al. (2007), at the beginning of which is supply chain, then demand management, and followed by demand planning. To explore demand planning process in details, the last part is our main task: key factors and key obstacles. We find information from
journals and books in order to gain more knowledge on this topic and make the research more reliable.

**Data Analysis Process**

Qualitative analysis of data concerns the non-numerical group of data, in the aim to discover in-depth information collected through interviews, questionnaires, case studies, etc (Labuschagne, 2003). Swanborn (2008) summarizes three traditional ways to do qualitative analysis in case study.

(1) The Yin tradition.

In this tradition, the most needed is an analytic strategy (Evers & Staa, 2010). The main way to do the analysis, according to Swanborn (2008), is to test hypotheses. Yin (2009) claims constructing theoretical propositions (like “why” and “how” questions) and then testing them could help to develop a descriptive framework entirely. Three specified techniques for analyzing have been proposed by Yin (2009), which are: pattern matching, explanation-building, and time series analysis.

(2) The Miles and Huberman tradition

Miles and Huberman have influential work in data analysis area (Swanborn, 2008). In this tradition, Graphic representations are preferred, rather than visual representations (Miles & Huberman, 1994). The basic tools are charts, matrixes, etc. Then fill these with key words, text fragments, quotations or summarized content instead of numbers in quantitative research. Miles and Huberman (1994) also propose analytic techniques such as flow charts, network drawings and decision charts. However, only graphic representation is not sufficient for most qualitative research.

(3) The qualitative, interpretative tradition

This tradition, according to Swanborn (2008), is mainly concerned with grounded theory which has been introduced ahead. The tradition is aim to build hypotheses and theories from back forward (Strauss & Corbin, 2008) By using a constant comparison technique, categories and core concepts are identified from raw data followed an inductive analytic process. Coding of the data, which means to label text fragments, is an essential element of in interpretative qualitative research (Evers & Staa, 2010). They state in the grounded theory, coding is used to reflect an ongoing process to interpret and build theory. It is an inductive stage of selective and axial coding following open coding.

As our research is to summarize key factors and obstacles and then test them, first tradition (the Yin tradition) is the most suitable one. At first, a literature review is conducted to acknowledge the global supply chain and demand planning process in demand management, and the key factors and obstacles in existing researches are
concluded. Then we select a case company to verify the key factors and obstacles. After gaining primary data from interview, we group them into three parts: demand planning process, key factors and key obstacles, and then describe these parts one by one. At last, we compare the findings with literature review: if they match each other, then the point is useful; if they do not, we will figure out what cause the difference.

The general qualitative data analysis process is described as below in figure 11:

**Figure 11 Data analysis process**

**Research Quality**

According to Seale (1999), the quality of qualitative research is important because it could influence the final result directly. The quality is generally regarded as validity and reliability of research (Merriam, 2004). As Labuschagne (2003) states, the validity and reliability of qualitative research depends on the extent of methodological skills, sensitivities, etc.
(1) Validity

Validity is defined as “a way to ensure quality in measurement, attest expected causalities and allow generalization” (Baumgarten, 2010, pp.4). In another word, validity of a research is whether the object of study is indeed what we want to research. So as to keep the validity of research, we have studied deeply in our research area, and select the case company having a good performance in our research area. Besides, we prepare interview questions based on our literature review. Through this ways, we can ensure that the information we get and the analysis based on the information are highly relevant to our research questions, and we have reached the objectives of the research.

(2) Reliability

Reliability, on the other hand, is “the extent to which measurement results are free from variable or experimental errors” (Krishnaswamy et al., 2006, pp. 144). That is to say, reliability means if similar study is done, whether we could get the same, at least similar results. Seales (1999) proposes triangulation to enhance reliability. Evers & Staa (2010) also claims the conclusion of research will be more convincing if more information from different sources is used. In a word, using different ways to collect information would improve research quality. To make the research more reliable, firstly in literature review, we collect information from printed sources which are thought more scientific; then in interview, we select four interviewees from both managers and employees, and they are interviewed separately. The view of only one person on a certain status may be not convincing enough, but multiple interviewees would reduce system errors. However, the system errors cannot be eliminated completely. Due to the limitation of resources and time, the thesis would be more reliable if we could have more case companies or gain more information from other aspects, for example the view of manufacturing and market department.

Limitation

There are two limitations for the research. Foremost, this thesis would be one of the few who study factors and obstacles in demand planning process systematically, which means, seems few history researches could be used or to compare with. The second limitation is the data. Only four managers in charge of demand planning department in the case company accept interview, and just one company is adopted. Many companies reject to provide information or accept our interview. Lack of data may lead to possible gaps in the research.
Findings

In this section, we conclude the primary data what we get from website and interviews. At first we introduce the basic information of the case company and industry it is in. Then the demand planning status in the company and how they do demand planning is described. Later the information is divided into success factors and difficulties, in order to make the comparison more clearly. How the company deals with the factors and difficulties is also described at the end.

Company and Industry Introduction

The Great Wall International System Technology Corporation Ltd. (ISTC) is signed up by the International Business Machines Corporation (IBM) and China Great Wall Computer Group at 12 December 2002 and will build into IBM’s global integrated supply chain strategic production base. ISTC is headquartered in Shenzhen Science and Technology Park and also has more than 1000 employees work in the export production base which located in Futian Free Trade Zone. ISTC focus on the manufacturing of server products and other IBM strategic product. ISTC is the main production base in in the Asia Pacific region and supports the global market. ISTC also products produce IBM system x, system z and P system servers and RSS (Retail Store Solution) products.

According to the International Data Corporation (IDC) Worldwide Quarterly Server Tracker, factory revenue in the worldwide server market decreased -6.2% (about $11.9 billion) in the second quarter of 2013. This is the second season of year-over-year revenue decline for server market demand continuing to soften in most geographic regions. Server unit shipments decreased -1.2% in 2013 to 2.0 million units, the third consecutive season that year-over-year server shipments have declined. Demand for mid-range and high-end systems experienced year-over-year revenue declines of -22.3% and -9.5% respectively in the second season in 2013. Volume systems also experienced a -2.4% revenue decline. According to Matt Eastwood, Group Vice President and General Manager, Enterprise Platforms at IDC, “Mainstream SMB and enterprise server customers around the world continue to focus on consolidation, virtualization, and migration initiatives aimed at increasing efficiency and lowering datacenter infrastructure costs”. He also said that “the competitive dynamics in the server market remain fierce as the leading server vendors work to offset weak demand for generally higher margin Unix and blade servers with lower margin rack and density optimized servers”.

According to Gartner, IBM had the first position in the worldwide server market based on revenue for the second quarter of 2013 (see Table 3)--the company posted worldwide server revenue of nearly $3.2 billion for a total share of 25.6 percent. its System z was the biggest revenue contribution.
In server shipments, HP remained the leader in the second quarter of 2013 (see Table 3) in spite of a year-on-year shipment decline of 13.6 percent for the season. Worldwide server shipment share of HP was 23.9 percent representing a 4.8 percent decrease in share from the same quarter in 2012. IBM took remain the third place in the second season of 2013 (see Table 4) in spite of a year-on-year shipment decline of 8.0 percent for the quarter. IBM's worldwide server shipment share was 8.5 percent representing a 1.1 percent decrease in share from the same quarter in 2012. These data also come from Gartner.

According to the 2012 annual report of IBM, System z revenue increased 5.4 percent (6 percent adjusted for currency) in 2012 versus 2011. P Systems revenue decreased 8.5 percent (7 percent adjusted for currency) in 2012 versus 2011 (IBM 2012 Annual Report). System x revenue decreased 3.7 percent (3 percent adjusted for currency) in 2012 versus 2011 (IBM 2012 Annual Report). High-end System x revenue increased 5 percent (6 percent adjusted for currency) in 2012 versus the prior year, while High-volume and blade servers declined year to year (IBM 2012 Annual Report). Retail Stores Solutions revenue decreased 52.6 percent (52 percent adjusted for currency) in 2012 versus 2011 (IBM 2012 Annual Report). The annual report also gives the comparison of the revenue between 2011 and 2010. We can see it in table

<table>
<thead>
<tr>
<th>Company</th>
<th>2Q13 Revenue</th>
<th>2Q13 Market Share (%)</th>
<th>2Q12 Revenue</th>
<th>2Q12 Market Share (%)</th>
<th>2Q13-2Q12 Growth (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM</td>
<td>3,156,584,672</td>
<td>25.6</td>
<td>3,496,145,346</td>
<td>27.2</td>
<td>-9.7</td>
</tr>
<tr>
<td>HP</td>
<td>3,089,886,031</td>
<td>25.0</td>
<td>3,747,482,751</td>
<td>29.2</td>
<td>-17.5</td>
</tr>
<tr>
<td>Dell</td>
<td>2,190,643,700</td>
<td>17.7</td>
<td>1,979,115,827</td>
<td>15.4</td>
<td>10.7</td>
</tr>
<tr>
<td>Oracle</td>
<td>716,749,999</td>
<td>5.8</td>
<td>772,760,548</td>
<td>6.0</td>
<td>-7.2</td>
</tr>
<tr>
<td>Cisco</td>
<td>539,172,000</td>
<td>4.4</td>
<td>376,320,000</td>
<td>2.9</td>
<td>43.3</td>
</tr>
<tr>
<td>Others</td>
<td>2,657,795,360</td>
<td>21.5</td>
<td>2,462,309,786</td>
<td>19.2</td>
<td>7.9</td>
</tr>
<tr>
<td>Total</td>
<td>12,350,831,762</td>
<td>100.0</td>
<td>12,834,134,257</td>
<td>100.0</td>
<td>-3.8</td>
</tr>
</tbody>
</table>

*Table 3 Worldwide: Server Vendor Revenue Estimates, 2Q13 (U.S. Dollars)*

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>System z</td>
<td>5.4%</td>
<td>6.30%</td>
<td>0.30%</td>
<td>-2.10%</td>
</tr>
<tr>
<td>P System</td>
<td>-8.5%</td>
<td>-7.4%</td>
<td>12%</td>
<td>9.5%</td>
</tr>
<tr>
<td>System x</td>
<td>-3.7%</td>
<td>-2.7%</td>
<td>5.7%</td>
<td>2.4%</td>
</tr>
<tr>
<td>RSS</td>
<td>-52.6%</td>
<td>-51.7%</td>
<td>11.6%</td>
<td>9.4%</td>
</tr>
</tbody>
</table>

*Table 4 Worldwide: Server Vendor Shipment Estimates, 2Q13 (U.S. Dollars)*
### Table 5: The Comparison of Revenues

<table>
<thead>
<tr>
<th>Company</th>
<th>2Q13 Shipments</th>
<th>2Q13 Market Share (%)</th>
<th>2Q12 Shipments</th>
<th>2Q12 Market Share (%)</th>
<th>2Q13-2Q12 Growth (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP</td>
<td>586,857</td>
<td>23.9</td>
<td>678,963</td>
<td>28.7</td>
<td>-13.6</td>
</tr>
<tr>
<td>Dell</td>
<td>551,000</td>
<td>22.4</td>
<td>541,693</td>
<td>22.9</td>
<td>1.7</td>
</tr>
<tr>
<td>IBM</td>
<td>209,833</td>
<td>8.5</td>
<td>228,138</td>
<td>9.6</td>
<td>-8.0</td>
</tr>
<tr>
<td>Cisco</td>
<td>77,729</td>
<td>3.2</td>
<td>49,054</td>
<td>2.1</td>
<td>58.5</td>
</tr>
<tr>
<td>Inspur Electronics</td>
<td>65,350</td>
<td>2.7</td>
<td>20,960</td>
<td>0.9</td>
<td>211.8</td>
</tr>
<tr>
<td>Others</td>
<td>969,342</td>
<td>39.4</td>
<td>847,671</td>
<td>35.8</td>
<td>14.4</td>
</tr>
<tr>
<td>Total</td>
<td>2,460,111</td>
<td>100.0</td>
<td>2,366,479</td>
<td>100.0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Facing the most of the decline in product revenues, as IBM’s main production base of servers, ISTC should bear the primary responsibility. If ISTC want to strengthen its place as a strategic production base, it should not only adapt the situation that production is growing fast and deal with it by best way, but also improve customers’ satisfaction continuously in an increasingly competitive market environment. Strengthening supply chain management is imperative.

### Demand Planning Status

IBM divides global business coverage area into three blocks: Asia Pacific (AP); Europe, Middle East and Africa (EMEA); Americas (AG) regions. ISTC in Shenzhen is mainly responsible for Asia-Pacific region, but also supports the three other areas mutually. Asia-Pacific region also includes seven smaller sub regions: Australia, New Zealand (ANZ); Korea (APK); Japan (APJ); ASEAN (ASEAN = Association of Southeast Asian Nations); Hong Kong (HK); Taiwan (TW); mainland China (PRC). APCP (AP central planning) means “Pacific Centre” in Chinese. IBM put the functional departments moved to Shenzhen from overseas, but the leadership is still overseas. The localization process of leadership is still ongoing. Figure 12 is System x Box Demand Planning Process:

In the beginning of the process, the sub-regions will collect the market data, sales data and historical data to make the original plan data. Then the sub-regions will reorganize the original plan data and submit the data to Asia Pacific Sales Operations Division. Then Asia Pacific Sales Operations Division will summarize and analyze the original plan data. They will send their analysis and the original plan data to Overseas Headquarter and Pacific Centre Ministry of Planning at the same time. In Overseas Headquarter, the managers their will have a review conference. Then they will work out the Authorized investment plan finalized data. Finally they input the data in DM (data modeling) system. Meanwhile, Pacific Centre Ministry of Planning continues their works. They input the original plan data in to DM to verify their accuracy first. Then they will maintain performance criterion in DM systems. The final plan data will be generated. Then the data will be sent to SAP system. Finally, the SAP data will be worked out and verified. At last, the SAP data will be sent to the
The Central planning department which is responsible for the demand planning will compare the quantity in plan with the actual number of orders and make analyses every month. This result is a standard measure of the demand planning work.

As a leading enterprise business operation, demand Planning drives the operation of all aspects in the company. It covers the entire process that the goods, technology, information or service move from suppliers side to demand side. IBM's China Procurement Center and planning centers are both in Shenzhen. They work in the same building. Now many other sectors have gradually moved to Pacific Centre in Shenzhen, which greatly facilitates the communication between planning centers with various departments. ISTC ensures the effective implementation of business activities in limited financial, human and material resources through the implementation of effective demand planning and guiding the company's efficient operation of various departments.
System X Box Demand Planning Process

Sub regional plans | Asia Pacific Sales Operations Division | Overseas Headquarters | Pacific Centre Ministry of Planning | Purchasing Department

Beginning

1. Production and submission of the original plan data
2. Summary and analysis of Original plan data
3. Review Conference
4. Input the original plan data to DM
   - Yes
   - No
5. Authorized investment plan finalized data
6. Confirm the Accuracy of the original plan data
7. Maintain performance criterion in DM systems
8. The final plan Data generated in DM then skip to the SAP
   - Check and adjust the SAP data
     - Yes
     - No
9. Verify the SAP data
   - Run MRP
10. Close SAP input mark

Procurement process
success factors

As one of the important strategic production bases for IBM, ISTC is responsible not only for the decrease of most of the decline in product revenues but also for the increase of most of the decline in product revenues in 2011 and the system z in 2012 that make sure IBM’s first place of the worldwide server market based on revenue in the second quarter of 2012. Here ISTC expounded its success factors, mainly reflected in the following aspects:

1. The perfect IT system

ISTC adhere to IBM’s tradition of investment in the system. They will pay high enough capital in the suitable systems for construction enterprise LAN, the introduction of computer management and enterprise internal information sharing. As the supply chain develops, ISTC feels that the whole supply chain management should depend more on information technology. According to the manager Ming Lu, the whole supply chain process form customer order to shipment is finished by the IT system. Manager Ming Lu claims that the supply process goes through a good number of sectors like water flow rushing from the upstream to downstream. Supply chain partners (suppliers) of the company can use electronic data interchange (EDI) systems to do forecasting for the large foreign enterprise’s demands as manager Ming Lu introduces. ISTC connects with the customers through Internet and other system tools. They use this way to accelerate the transmission speed of the order effectively, to avoid repeated entry, to improve stocking, transport efficiency and accuracy, to shorten order cycle and reduce order cycle uncertainty. Using these electronic interchange systems also enables suppliers to understand the needs of enterprises and inventory information, and re-supply these companies re-supply. Errors and the uncertainty in demand planning process have been reduced by advanced system at the same time. The efficiency is also improved. According to Ming Lu, ISTC is equipped with a team that constitutes of sophisticated system manageable and technical personnel. This team treats the company's normal operation of the system as their own mission. As long as where there are problems, they are always able to provide help and support.

2. Comprehensive planning system

ISTC think that forecasting model is important to companies’ demand planning for its reasonable method to deal with data. But manager Ming Lu states that there is no identified forecasting model that everyone thinks it is best. The company should not only find the forecasting model that is suitable, but also to build a comprehensive planning system which include the forecasting model. Manager Ming Lu claims that ISTC has owned suitable demand forecasting tools and a more mature perfect planning system. They can enable the enterprise to make the right analysis and evaluation to the changes in demand, and make accurate forecasting to the changes of future market. Then the company can make procurement, production and other
decisions that close to the real market situation relatively. The impact of the distorted fluctuation in real demand is decreased thanks to the operability of planning system, more accurate real-time information, avoiding multiple demand forecasting and planning system’s closeness to market. It will be more reasonable to make the production, operation arrangements on the basis of grasping the real market information, and a lot of waste will be avoided. At the same time, customer satisfaction and the speed of delivery will also be improved greatly.

3. Advocate innovation

Manager Yalin Mai thinks that companies will lose its vitality, be hard to move forward and even impossible to survive without innovation in nowadays’ economic surroundings. On the one hand, ISTC invest huge amounts of money in product development. They provide a steady stream of new products faces to customers in technology innovation, and pursue excellence in products and services. On the other hand, ISTC has series internal incentive mechanisms to encourage innovation in supply chain management. ISTC will organize brainstorming activities throughout the whole company every season. The company would like to invite family members of employees, customers to give suggestions and views about the company. They will reward the innovative individual employees or groups by traveler’s checks, money and other kinds of incentives.

4. The importance of cooperation

The cooperation they talked, including cooperation in the external and internal cooperation.

ISTC understand the vital importance of cooperation, they actively communicate with their partners. According to manager Yalin Mai, ISTC establishes positive achievable goals with their supply chain partners and support these goals together for success in supply chain. They believe that sharing value concept with the partners is helpful to establish long-term beneficial relationship. They have realized that they should abandon the traditional enterprise frown seclusion and one-stop production model of self-sufficiency. According to manager Yalin Mai, ISTC improve the flow of information through upstream and downstream enterprises; reduce the total number of warehouse through shared inventory and deliver the goods accurately and timely through the cooperation with the third party logistics. These behaviors help ISTC minimize cost and inventory, and improve the competency of the company. Especially, they give the company most accurate information and stable relationship with different aspects in demand management to make suitable and accurate plan in predetermined time.

ISTC also emphasize the importance of teamwork inside the company. According to manager Weikun Zhou, they put the staff’s spirit of cooperation in a very important position. They put a staff team spirit of cooperation as part of the performance. Every different department in the company will communicate with each other every month.
Some of the departments in ISTC are almost in the same building in Shenzhen. Manger Weilin Zhou claims that it is easy for ISTC to have a meeting among these departments to exchange and verified information every one or two weeks in Shenzhen. They realize that the frequently internal information communication can help the company reduce the demand uncertainty and make the demand planning more accurately. The staff also feels that they make less mistakes for the accuracy of information because this kind of internal information communication.

5. Employees are greatest asset

The operation of the entire supply chain cannot go without employees. Smooth supply chain is always required to maintain the high-quality personnel. Manger Weilin Zhou states that ISTC's success is inseparable from the concept of "treat company's employees as the greatest wealth and make it continue to add value". According to Weilin Zhou, ISTC has a set of unique and complete system in personnel management and an extremely excellent staff training system. ISTC provides staff with a variety of suitable training opportunities for further studies to help them learn and grow brilliant individual career achievements from management training of junior executives and senior professionals to succession planning for Mid-level executives and senior professionals. Meanwhile, they also ensure a steady flow of talent will be provided for ISTC. The talents insure that the different part of the company will remain competitive, demand planning part included.

6. Performance Evaluation

The success in demand management needs positive employees. In order to motivate employees, manager Baohua Zhong states that ISTC would like to use a unique and effective payroll management to reward progress, urging mediocre. According to Baohua Zhong, every employee's salary consists of fixed basic salary and the floating wage in ISTC. Manager Baohua Zhong claims that there is a key reference indicator called PBC (Personal business commitment plan) for the criterion of the floating wage. You will have one year PBC (Personal business commitment plan) as long as you are the employee of ISTC. Making PBC is an interactive process. Employees and their immediate managers discuss the plan together to make it realistic. After several revisions, the immediate managers of their employees have achieved a one-year commitment. The managers will be very clear about the work and focus of their employees. The employees also very clear about what they should do this year. ISTC will inspect the staff from three aspects for individual performance assessment. At first, the employees must complete their work that planned in PBC no matter how hard it is. The second is execution. Execution is a process which reflects the quality of the staff. Execution is very important to a monitoring process. The last one is teamwork. ISTC uses the mature matrix structure management model. Every one thing will involve many other departments. Hence, Sense of cooperation should be the first consciousness. Every employee should be ready to help others. This kind of performance evaluation can improve the performance of employees. Then the
different departments in ISTC will get high efficiency, demand management included. They also treat this issue as one important factor in their demand planning process.

7. Customer Satisfaction Survey

In ISTC, Customer’s demand is always in the first position. According to Manager Yalin Mai, customer satisfaction is their constant pursuit. ISTC will pay more attention to the customer satisfaction survey every year. They think this is a chance to examine their own supply chain management from other perspectives. They can find shortcomings and fix them to improve customer service levels by this way. In terms of specific operation, IBM hires an international company specializing in customer satisfaction survey to design questionnaires for the IBM branches. Meanwhile, ISTC also have their own surveys based on the communication with customers. The practices and methods of customer satisfaction survey that IBM used for years have been imitated by many companies in this industry. Accurate and timely feedback of customers also give company accurate information to the demand planning process. The uncertainty of market also will be weakened to some extent. They also know more about the demand of customers mainly in these two ways.

Difficulties and challenges

Although ISTC have many success aspects for demand management, but they cannot cover the truth that different products revenues decline in last three years. They also faced difficulties and challenges these years. These obstacles lead to the decline in products revenues these years. ISTC shows us the problem they have met in recent years. Here are the problems that they show to us:

1. The effects left over from process of "vertical integration" to "horizontal integration"

According to Manager Yalin Mai, ISTC began their vertical development like many other Chinese enterprises from the beginning of 1990s to early 2000s after high speed development. ISTC have produced IBM desktop computers, laptops, NETVISTA, X series servers and X series server options. Products have gradually expanded to other areas of the Americas since the support for the seven sub-regions in Asia-Pacific. In 2002, IBM sells their hard disk drive business to Hitachi and the PC manufacturing business to Sanmina-SCI Corporation. Despite not making money, they still retained the PC business. Lenovo bought IBM PC business in the price of 1.2 billion $ 50 million and become the world's third-largest PC vendor in the end of 2004. IBM only retained servers, middleware, and other hardware for commercial customers in order to strengthen the company's software and consulting services business. These decisions of IBM are aimed at to evolve as "service" the company more thoroughly. It is a problem for IBM to reorganize their company and allocate the resources from the beginning. At the same time, as the main manufacturer of IBM, ISTC is also impacted. The operation of ISTC is mainly decided by IBM. Without the production of desktop
computers, laptops and NETVISTA, the demand planning is also changing as the change of IBM. New business is also added in the business list of ISTC, they should deal with them without too much historical data. In this process, uncertainty and problems in reorganization are the main obstacles in the demand management to ISTC.

2. Uncertainty in the business environment

With the globalization of markets, manager Weilin Zhou claims that the saturated development trend of product demand and the rapid development of science and technology make the business environment changing greatly. Because of the rapid development of technology, customers will have more and more personalized demands. Replacement cycles of products are getting shorter. These changes make the competitiveness of enterprises changing from the original price-based competition to competition based on quality and service, and ultimately transferring to the given time competition. These changes all increase the uncertainty in the business environment. ISTC realized that the changing of business environment impact the marketing analysis, sales analysis and historical data analysis in demand planning process. They make the output of these analyses not very accurate. The other parts of the demand planning process are also impacted because of the inaccurate analyses.

3. Cross-use multiple systems

According to manager Ming Lu, the company only has the 20 percent of original employees after the spin-off PC business. But they also use the original several systems (such as SAP, DM, MAPICS, etc.) as before. Data modeling (DM) is a process used to define and analyze data requirements needed to support the business within the scope of corresponding information systems in organizations. SAP (systems applications and products in data processing) is one of the ERP systems that considers more carefully to the enterprise architecture and financial control. It is the most rigorous system in the overall control logic and the overall system architecture. MAPICS is also a commercial ERP software that created by IBM used to control the operations of manufacturing companies. Its name is an acronym for Manufacturing, Accounting and Production Information Control Systems. Manager Ming Lu claims that they don't have clear mind to use specified system in each demand planning process. The managers reflect that two or more systems will be cross-used in in demand planning process of some products. For example figure 1 shows that DM and SAP has been cross-used in System x Box Demand Planning Process. The same task will be done twice in the two systems, which will not only need to spend the extra manpower, resources, but also impact the accuracy of the scheme because of the different criterion in different system.

4. Problems in planning cycle

According to manager Weilin Zhou, their planning cycle is normally two weeks. The market has changed dramatically during this period. It makes plans lags behind the
reality demand and did not make the plan play a leading role. The supply problem will be caused for insufficient number of delivery and seriously extended delivery. Situation of emergency supply appears frequently. Planners are busy dealing with the emergency. It will result in the company's operations disorder, affect the company shipped orders and reduce customer satisfaction. Meanwhile, the company has the task of "increasing sales, sales targets, reduce production costs". Finally, it results in the conflicts among ISTC and other sub regions and the conflicts inside the ISTC.

5. Problems in planning mode

According to manager Baohua Zhong, the company has been adhering to the planning mode which makes plan based on the top end product. Planning department input the data of finished products into the system. According to the BOM (Bill of Material) come from the system, the lower material list will be made. According to the lower material list, purchasing department purchases the material from suppliers. This is not only against to the demand for materials and inventory control, but also not conducive to the planner's macro control of the material. As a parallel position with AP (Asia Pacific), IBM's other two regions (EMEA (Middle East and Africa) & AG (Americas)) had begun the planning model which is based on the underlying material a few years before.

6. Problem in planning department functions

According to manager Weilin Zhou, central planning department does not grasp the true planning center functions. The so-called central planning department is responsible for the company's central planning. At the same time, it should be responsible for the work on the company's plans. In ISTC, the data that should be input into the system and guide the planning work is the original data that come from sub regional department who knows nothing about the supply. Once the accuracy of input data is negative impacted, the outcome of forecasting model and other systems will be unbelievable. It leads to negative effects on statistical analysis in demand planning. Central planning department become an extra department that Exist in name only. At the same time, lots of manpower, material resources and capital have invest in this department and wasted actually.

7. Bullwhip effect

According to manager Ming Lu, department chain involved in the planning process is very long and cross-regional, as well as jet lag. Although there is good internal information communication in the departments in Shenzhen, the problem of insufficient information exchange exists among Manufacturers and heads of the sub-regions. Sub-regions are responsible for obtaining the first hand various demands and sales information from the market directly. ISTC' manufactures only obtained market information from these sub-regions and cannot get the real first line demands of market fully. Meanwhile, the sub-regions cannot obtain the information of inventory and production cycle in ISTC and understand them in time. The problem of
information sharing also exists among the suppliers of ISTC. Lengthy internal structure and supply chain lead to the serious bullwhip effect in ISTC. They admit that information asymmetry has existed in the company for long time and result the decline not only in financial but in the belief among their supply chain partners.

**Improvements and Solutions**

Based on the success factors, difficulties and challenges in ISTC’s demand planning process, ISTC is trying to use some methods to improve the demand planning process. According to ISTC, the problem results from the changing of thinking in the process of "vertical integration" can be improved by training and education in corporate culture aspects.

According to manager Ming Lu, ISTC has used the comprehensive planning system to make accurate forecasting, avoid multiple demand forecasting and plan system’s closeness to market, satisfying customers and fast delivery. They think it is an important way to reduce the effects of market uncertainty. In order to weaken the market uncertainty in demand planning process, customer survey is also being used now. These two methods are main way for reduce the negative impact of uncertainty in business environment.

In order to solve the problem of cross-used systems, Ming Lu claims that ISTC try to simplify the operation systems. The company follows the past patterns. The operation systems are cross-used in the demand planning process. ISTC is trying to use the single specified system for different products. For example, they try to use MAPICS for P system server, and use SAP for X system server. They want to use this way to solve the problem of system cross-used.

Based on the solution of cross-used systems, the demand planning cycles can be improved. Manager Weilin Zhou states that the planning cycle can be reduced for one week as a demand planning cycle. Thanks to the simplified operation system, the time spend in data operating in different systems can be saved. For example, a MRP data should operate in SAP and DM before simplifying. Now it can be just dealt with in DM, and the time has been saved. Next step is to reduce the time spend in MRP cycle. They believe that these two steps can shorten the demand planning cycle.

As a parallel position with AP (Asia Pacific), IBM's other two regions (EMEA (Middle East and Africa) & AG (Americas)) had begun the planning model which is based on the underlying material a few years before. According to manager Baohua Zhong, ISTC determines to try the planning model which is based on the underlying material in demand planning process. They are planning to abandon their outdated planning mode and use the new planning mode gradually.

ISTC think it is a hard work to make a revolution for improve the function of central planning department. According to manager Weilin Zhou, they determine to train the
employees in central planning department to strengthen their professions. Then these employees will be sent to the sales regions to gasp more market information and have a good communication with the sales staff in specified time period. They think this way can make the central planning department closer to the market. They will have more information about the market trends and availability. The demand plan they make will be more accurate.

Manager Ming Lu states that ISTC is trying to make a platform for information sharing between planning department, various sub-regional sales representatives and overseas headquarters. It can be shown as figure13: Demand planning center gain information from sub-area sales representatives, and other departments in the company, such as marketing department, warehouse manager, design department, etc. Then, after making demand plan, it gives the result to each relating department as well as offshore planning center of IBM.

Besides these main methods, manager Yalin Mai claims that ISTC also put forward many other ways to improve the demand planning process. They build the process to deal with emergency orders. As long as the order is confirmed, purchase request is input immediately into fulfillment purchase requisition database. Then the order goes to purchasing department after approval. Purchasing department sends order to suppliers. At the same time, system will track the whole process and remind to related employees when one process is finished. They also try to improve production capacity planning.
Analysis and Discussion

In this chapter, we compare our findings to the theories to analyze and discuss three parts. First of all, demand planning process is analyzed from both theoretical and practical way. Following are our main task: key factors and key obstacles. In each part, we analyze the points in theory though the result from case study, then discuss the key factors and obstacles that cannot be found in theory. Improvements based on key factors and solutions for key obstacles are proposed at the last of this part.

Demand planning process

Zinnert (2010) claimed that the long term demand plan interrelate with organizational functions, apart from production processes, such as Marketing and Human Resources as promotional activities need to be planned as well as personnel aligned. Zinnert (2010) thinks it is important to integrate all areas affected by the demand planning into the forecasting process on the ISCM (International Supply Chain Management) as well as on the external SCM level. It is crucial to the quality of the forecast to build a structured demand planning process.

As main manufacturer of IBM, ISTC (International System Technology Corporation) has its specified demand planning process. The demand planning cycle is two weeks as they claimed. It is not an exactly long term demand planning. But there are also some same points with the theory of Zinnert (2010). The manager takes System x Box Demand Planning Process as an example to show their main demand planning process. The whole process is the cooperation among five main organizations: Sub regional, Asia Pacific Sales Operations Division, Overseas Headquarter, Pacific Centre Ministry of Planning and Purchasing Department. Subordinate departments of these main organizations support the whole demand planning process according to their specified function. DM (Data Modeling) and SAP (systems applications and products in data processing) are used during the demand planning process. The main departments of ISTC are in the same building in Shenzhen, except the Overseas Headquarters. The localization process of leadership is still ongoing. This structure makes the resources allocation more efficient. ISTC’s demand planning process also has some different points with the opinion of Zinnert (2010). In their description of their demand planning process, they didn’t mention the production process. We can see that Zinnert (2010) treat demand forecasting as the most important aspect in the demand planning process. ISTC also don’t show their opinion of demand forecasting. ISTC only shows their point to forecasting models. They think that forecasting model is important to companies’ demand planning for is reasonable method to deal with data. ISTC states that there is no identified forecasting model that everyone thinks it is best. The company should not only find the forecasting model that is suitable, but also to build a comprehensive planning system which includes the forecasting model.

According to the suggested demand planning process by Crum et al (2003), the
demand plan is based on multiple inputs—from the sale, marketing, and product management organizations as well as statistical analysis. We can know that the planning cycle of this suggested demand planning process is 1 to 18 months or longer than 18 months according to the information that shown in figure 5. The theory mainly used to give a suggestion to the companies who want to make a long-term or mid-term demand planning process.

The demand planning cycle of ISTC is two weeks as they said. It should be a short-term demand planning process. Compared with the theory of Crum et al (2003), there are also some same points in this demand planning process. In the beginning of the process, the sub-regions will collect the market data, sales data and historical data to make the original plan data. This is the sales input, market input and part of statistical analysis. The managers of Overseas Headquarter will work out the Authorized investment plan finalized data and input the data in DM system. Pacific Centre Ministry of Planning will input the original plan data in to DM to verify their accuracy. Then they will maintain performance criterion in DM systems. The final plan data will be generated and sent to SAP (systems applications and products in data processing) system to be worked out and verified. Purchasing Department will send them to MRP (Material requirements planning). These processes are mainly for statistical analysis. There are also two points that mentioned little by ISTC: business plan and strategy and product/brand management input. In the introduction of System x Box Demand Planning Process, ISTC show nothing about these two points. When talking about the difficulties in their demand planning, they mentioned about the effects left over from process of “vertical integration” to "horizontal integration" are the challenge for them. But in the most information they have given, we cannot find more behaviors in these two points.

According to the facts of ISTC and the literature review, we can conclude a general demand planning process for ISCT or the companies like them. The planning cycle is no longer than 1 month. The demand planning process is interrelated with organizational functions such as marketing and human resources as promotional activities need to be planned as well as personnel aligned. The demand plan is based on multiple inputs—from the sale, marketing, and statistical analysis. This demand planning process relies on comprehensive planning system more than just forecasting models. Business plan and strategy and product/brand management input will be mentioned little in the whole process.

Key Factors

Many scholars talked about the key factors of demand planning in their study. We conclude five key factors in theory part. ISTC gives lots of information about the demand planning when they talk about their success factors, difficulties and challenges. Compared with the facts of ISTC, new key factors and the key factors in theory of the scholars will be discussed.
Factor identified by theory and compared to case

In previous section (pp.10), we have reviewed many articles which emphasize the importance of cooperation along supply chain. For example, Vlckova et al (2011) claim that confidence between individual links of supply chain and their willingness to cooperate in the field of information sharing about demands and sales are important. According to ISTC, they also think cooperation is one important success factor in demand planning. They actively communicate with their partners. ISTC improves the flow of information through upstream and downstream enterprises; reduce the total number of warehouse through shared inventory and deliver the goods accurately and timely through the cooperation with the third party logistics. These behaviors help ISTC minimize cost and inventory, and improve the competency of the company. Their partners give the company most accurate information and stable relationship with different aspects in demand management to make suitable and accurate plan in predetermined time. Hence, we can see the function of good relationship with supply chain partners is not only information sharing, but also low cost, low inventory and increased competence.

Forecasting model is another key factor found in literature review (pp.11). As Zhao et al. (2002) states, the performance of a production and inventory system will be impacted by the selection of forecasting model. According to ISTC, forecasting model is important to companies’ demand planning for its reasonable method to deal with data. There is no identified forecasting model that everyone thinks it is best. ISTC think that the company should not only find the forecasting model that is suitable, but also to build a comprehensive planning system which include the forecasting model. The planning system of ISTC enables the enterprise to make the right analysis and evaluation to the changes in demand, and make accurate forecasting to the changes of future market. Then the company makes procurement, production and other decisions that close to the real market situation relatively. Thanks to the operability of planning system, more accurate real-time information, avoiding multiple demand forecasting and planning system’s closeness to market, the impact of the distorted fluctuation in real demand is decreased. It will be more reasonable to make the production, operation arrangements on the basis of grasping the real market information, and a lot of waste will be avoided. At the same time, customer satisfaction and the speed of delivery will also be improved greatly. The facts of ISTC show that the demand forecasting model should be a key factor in demand planning process compared with the theory. But this is not the most important factor because it is just a part of a comprehensive planning system. The function of a comprehensive planning system is making accurate forecasting, avoiding multiple demand forecasting and planning system’s closeness to market, satisfying customers and fast delivery.

According to Zhao et al (2002), high quantity and accurate input data are important in using forecasting models. Crum et al (2003) introduces one of most frequently used statistical forecasting method called the times series technique for the advantage of decreasing the bias of human judgment and improving the process of demand
forecasting. When talking about the difficulties of demand planning, ISTC mentioned the awful input data that leads to the negative effects on statistical analysis in demand planning result from the problem in planning department functions. They do a poor job in this aspect. The outcome of forecasting is unbelievable sometimes for the bias of input data. From this aspect, we can see input data will have important impact to the outcome of forecasting and the statistical analysis.

According to Frohlich, (2002), information communication in the supply chain can reduce demand uncertainty, and the cost of inventories in the process of matching supply with demand in the supply chain network. ISTC think cooperation is one success factor in their demand planning. The cooperation they talked, including cooperation in the external and internal cooperation. ISTC emphasize the importance of teamwork inside the company. They put a staff team spirit of cooperation as part of the performance. Every different department in the company will communicate with each other every month. The staff of ISTC realizes that the frequently internal information communication can help the company reduce the demand uncertainty and make the demand planning more accurately. They also feels that they make less mistakes for the accuracy of information because this kind of internal information communication. We can see, the facts of ISTC are just in line with the theory in most parts. The good internal information communication can reduce demand uncertainty, cost and important to information systems.

The case of TOYOTA demand chain management shows that demand planning cycle should be set in different situations for the cost of inventory. Marshall et al (1994) states that the reduction in cycle time offers the potential to reduce the cost of stock-outs and markdowns by allowing production decisions to be differed until more information and better forecast available. ISTC has some problems in their demand planning cycles. Their planning cycle is normally two weeks. It makes plans lags behind the reality demand and did not make the plan play a leading role. The supply problem is caused for insufficient number of delivery and seriously extended delivery. Situation of emergency supply appears frequently. Planners are busy dealing with the emergency. It results in the company’s operations disorder, affects the company shipped orders and reduces customer satisfaction. Finally, it results in the conflicts among ISTC and other sub regions and the conflicts inside the ISTC. Compared with the problem of ISTC, we can see that the controlling of demand planning cycle can reduce the cost of stock outs, the happening of emergency and markdowns by allowing production decisions to be differed until more information and better forecast available.

· New key factors from case study (not previously identified by theory)

Except the key factors that mentioned in theory part, other several new key factors can be found from the information that provided by ISTC.

ISTC believe innovation will bring great competence in every area inside the
company. They advocate innovation in many aspects. ISTC has series internal incentive mechanisms to encourage innovation in supply chain management. ISTC organizes brainstorming activities throughout the whole company every season. They would like to invite family members of employees, customers to give suggestions and views about the company. They will reward the innovative individual employees or groups by traveler’s checks, money and other kinds of incentives. Hence, we can see innovation is a key factor in supply chain management for increasing competence. As one part of supply chain management, demand management will be positively influenced.

ISTC thinks that the operation of the entire supply chain cannot go without employees. The company has a set of unique and complete system in personnel management and an extremely excellent staff training system. As mentioned in the Findings part, ISTC has provided staff with a variety of suitable training opportunities for further studies to help them learn and grow brilliant individual career achievements. Meanwhile, the company also ensures a steady flow of talent for future. The talents insure that the different part of the company will remain competitive, demand planning part included.

As what has been mentioned in the Findings part, ISTC uses a unique and effective payroll management to reward progress, urging mediocre. Every employee’s salary consists of fixed basic salary and the floating wage in the company. PBC (Personal business commitment plan) has been used as a key reference indicator for the criterion of the floating wage. ISTC uses the mature matrix structure management model. This kind of performance evaluation can improve the performance of employees. Then the different departments in ISTC will get high efficiency, demand management included. We can conclude that reasonable performance evaluation will encourage employees to do their job efficiently. That leads to the high efficiency in demand management department.

ISTC pay much attention to the customer satisfaction survey every year. As we mentioned in the Findings part, ISTC thinks it is a chance to examine the supply chain management from other perspectives. Shortcomings can be found and fixed to improve customer service level. Accurate and timely feedback of customers also give the company accurate information to the demand planning process. The uncertainty of market will be weakened to some extent. We can make sure that the customer satisfaction survey can weaken the market uncertainty in demand planning process and increase the satisfaction of customers to the whole supply chain management.

Here we can organize these key factors in table 6:
<table>
<thead>
<tr>
<th>Key Factors in literature</th>
<th>Key Factors in the case</th>
<th>New Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relationship with Supply Chain Partners</td>
<td>Relationship with Supply Chain Partners</td>
<td>Information sharing, low cost, low inventory and increased competence.</td>
</tr>
<tr>
<td>Information Technologies and Forecasting Model</td>
<td>Comprehensive planning system</td>
<td>A comprehensive planning system includes the suitable forecasting models. It will help the company to make accurate forecasting, avoid multiple demand forecasting and plan system’s closeness to market, satisfying customers and fast delivery.</td>
</tr>
<tr>
<td>The Quality of Input Data</td>
<td>The Quality of Input Data</td>
<td>Accurate and latest input data will improve the process of demand forecasting and influence the outcome of statistical analysis in positive way.</td>
</tr>
<tr>
<td>Information Communication within Corporation</td>
<td>Information Communication within Corporation</td>
<td>Good information communication within corporation can reduce demand uncertainty, cost and important to information systems.</td>
</tr>
<tr>
<td>Demand Planning Cycle</td>
<td>Demand Planning Cycle</td>
<td>The controlling of demand planning cycle can reduce the cast of stock outs, the happening of emergency and markdowns by allowing production decisions to be differed until more information and better forecast available.</td>
</tr>
<tr>
<td>Innovation</td>
<td>Innovation</td>
<td>Innovation is a key factor in supply chain management for increasing competence.</td>
</tr>
<tr>
<td>High-quality Employees</td>
<td>The talents insure that the different part of the company will remain competitive, demand planning part included.</td>
<td></td>
</tr>
<tr>
<td>Reasonable Performance Evaluation</td>
<td>Reasonable performance evaluation leads to the high efficiency in every department, demand management department included.</td>
<td></td>
</tr>
<tr>
<td>Customers Satisfaction Survey</td>
<td>Customer satisfaction survey can weaken the market uncertainty in demand planning process and increase the satisfaction of customers.</td>
<td></td>
</tr>
</tbody>
</table>

*Table 6 Key factors in demand planning process*
Key obstacles

Beside the key factors, there are also many key obstacles in demand planning process. In theory part, we have summarized four obstacles, they are: market dynamic, information system security/breakdown, database diversity and bullwhip effect. Here we test these four obstacles in case study at first, and then we get some new key obstacles through our case study.

- Key obstacles identified by theory and compared to case

According to the literature review (pp. 14), market dynamics is a challenge for demand planning. Market dynamics, combining theory and the case study, can influence demand planning process from two main aspects. One is the way of doing business. Changing market circumstance has forced IBM to sell its PC business and turn to a service corporation, which then impact ISTC as a consequence. Quality of product and service becomes more important. In this occasion, demand planning process needs to be more flexible and quick-respond to customer orders. The other aspect is the accuracy of demand forecasting. Market dynamics causes increasing product variety and demand uncertainty, thus leads to demand forecasting becoming more complex and inaccurate. In ISTC, as they have different systems for different products, increasing product variety will let demand planning more complicated. Demand uncertainty will greatly influence the performance of demand planning, and also is a main cause for emergency orders, which is going to be discussed later.

Poor information system security or system breakdown will harm demand planning process (pp.15). But in ISTC, it is not considered as an important obstacle. The company has a network administrator and few additional computers in case someone’s out of work, and it is sufficient to handle problems of information system in daily work. According to the interview, ISTC does not have accident like whole system breakdown or seriously virus attack. In another word, information may be an obstacle, but not as important as a key obstacle. We get three reasons to explain the difference. First of all, main information system of ISTC is inherited from IBM, which is stable and with high security already. As a result, they avoid suffering of system crashing or information stolen. The use of antivirus software and firewall helps it as well. Another reason is the location. Natural disaster, stated by Faisal et al. (2007), is a cause for system breakdown, such as earthquake and hurricane. However, where ISTC locates is not a place disasters like to visit. Besides, the network circumstance in China also makes contribution. Chinese government tightly regulates the network order so that few intentional attacks happen, even though intentional attacks is also a comment event threatening information system according to Faisal et al. (2007). Small viruses can only influence single computer, instead of the whole information system.

In ISTC, database diversity reflects on cross-use of multiple information systems. They have many systems used in different departments at the same time, such as SAP,
DM and MAPICS. There are many people stress the importance of an integrated information system in demand planning process (pp.16). Cross-use of multiple information systems gives rise to chaos in demand planning process. For ISTC, the impact of multiple information systems is more than overflow and redundancy. As a same task, such as inputting data, is done more than once in different systems, extra manpower, time and costs actually have been wasted. Moreover, cross-use of multiple information system will result in confusion. Because different systems have different criterions, the result of which system is more reliable and can be used in practical work becomes a new problem. Additionally, it also extends the demand planning cycle. The existing demand planning in ISTC is done as inputting the planning data of one cycle into two different systems, one system for one week. As a result, the data is all in a mess and seriously lagged for one week. The performance of such demand plan is also terrible. All in all, in order to make demand planning progress perform well, cross-use of multiple information systems should be avoided.

Based on our literature review, the influence of bullwhip effect has been demonstrated by many researchers. Based on Menzter et al. (2007), ISTC as an up-stream component in supply chain is among those who suffer bullwhip effect the most. A significant cause for bullwhip effect in ISTC is information asymmetry. ISTC cannot acquire complete information of market and other departments. There is a great deal of departments coming from different sub-areas and involving in demand planning process. Sub-area departments are responsible for collecting the demand and sales information of market, and ISTC gain demand information from them. But the communication between ISTC and sub-area departments is not always so good, and what ISTC get is incomplete information. Meanwhile, sub-area cannot acquire the information of inventory, production cycle, etc. The same problem happens in the information transmission among ISTC and its suppliers. Incomplete information will decrease the accuracy of demand planning. Building a good information sharing system would help to restrain bullwhip effect. However, as so many departments involves in, eliminate bullwhip effect is almost fairy tale.

- New key obstacles in case study (not previously identified by theory)

Beside the ones found in literature, we also find two obstacles that have been mentioned few in literatures but which do have great influence on demand planning process from our case study. They are emergency orders and geographical differences.

Emergency orders are those orders out of plan and often would be fulfilled in a short time. The demand of market is changing from time to time. However, plans cannot keep pace with changes. Even though the total quantity of production is somehow predictable, when consumer makes its order and how the order is could not be seen forehead. If a consumer suddenly makes an order that beyond the demand planning, the whole company will fall into a mass. Staffs in the company will be busy dealing with the emergency order, and original demand and manufacturing plan is put away. As company put effort to fulfill this emergency order, they cannot share effort to
handle regular orders. Then, after the emergency order is done, company will keep busy with regular ones. It will increase the pressure for entire company and make demand planning fails totally. It directly impacts the performance of demand planning process. A good forecasting could reduce the frequency of emergency orders, but cannot eliminate them completely. Emergency order is not the problem only in ISTC. Actually, every manufacturing factory faces the obstacle more or less, especially in electrical equipment industry. Life cycle of product, accelerated updating of product, and fierce competition all drive emergency orders.

Geographical differences involve time difference, geographical distance, languages, etc. As a global division, geographical differences causes lots troubles for demand planning center in ISTC, especially in communication. In fact, it is a problem all global businesses need to solve. For example, all employees in demand planning center are Chinese, but when they communicate with suppliers, consumers, or sales department those in Japan, they cannot understand each other. General translation also causes loss of specialized information. Time difference is a big problem and there is almost nothing can be done to deal with it. It is hard to find some time available for everyone. Somebody would change working time, or communication is done separately. No matter in which way, communication cannot go on perfectly. Geographical distance also brings many problems. Meeting face-to-face is a good and quick way to communicate, for every one could understand each other better through body language or so, and information exchange goes fast. But it is hard to realize as partners in demand planning is all over the world. Travelling from one place to another cost much of money and time. In a word, geographical differences seriously influence the efficiency of demand planning process, and will result in poor performance of demand planning.

Key obstacles are organized in table 7:

<table>
<thead>
<tr>
<th>Key Obstacles in literature</th>
<th>Key Obstacles in the case</th>
<th>New Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market dynamic</td>
<td>Market dynamic</td>
<td>Market dynamic changes the way of doing business and increase demand uncertainty</td>
</tr>
<tr>
<td>Information system security/ breakdown</td>
<td>(It is an obstacle rather than a key obstacle)</td>
<td></td>
</tr>
<tr>
<td>Database diversity</td>
<td>Cross-use of multiple information systems</td>
<td>Several systems are used at the same time, instead of an integrated information system</td>
</tr>
<tr>
<td>Bullwhip effect</td>
<td>Bullwhip effect</td>
<td>Information asymmetry among company itself, market and involving departments, which would result in inaccuracy of demand forecasting</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Emergency Orders</td>
<td>The orders out of plan and often require to be fulfilled in a shore time</td>
<td></td>
</tr>
<tr>
<td>Geographical Differences</td>
<td>Problems caused by geographical diversity, including time difference, geographical distance, languages, etc</td>
<td></td>
</tr>
</tbody>
</table>

*Table 7 Key obstacles in demand planning process*

**Improvements and Solutions**

In order to avoid the obstacles and improve the performance in demand planning process, we propose some possible solutions based on the situation of case company, which may also be advices for other manufacturing companies.

(1) Simplify operation system

Applying one operation system on all different products in the company would reduce waste of time, cost and human resources, meanwhile, improve the accuracy of demand planning and keep inventories down. Besides, as information is performed and gained more easily, consumer services will get improvement at the same time. For example, the case company now has three different departments in charge of manufacturing and planning server X, server P and RSS, because they use different systems. If they use the same system, only one department is needed. Additionally, thanks to the simplified system, information is integrated, which would be very beneficial for demand planning process.

(2) Reducing planning cycle based on the simplified system

Using simplified system and remove unnecessary parts, the planning cycle could be reduced from two weeks to one week. Hence, the demand planning process will be more flexible to the changing business environment, and the result will be more accurate. The demand planning process which is being used right now in ISTC, as describe ahead in the part of cross-use of multiple information system, seriously influences the performance of demand planning process. But in the simplified system, just one system is used, so two planning cycles could be done in two weeks. On this occasion, demand data can tell the true story of market trends. Moreover, the errors occurred and waste of resources between two systems can also be avoided. Emergency orders are also less likely to happen.
(3) Change original planning mode

The planning mode used in the case company is always based on final products. In details, that is: inputting analyzed demand of final products, and then system calculates how much semi-finished products, components or raw materials are needed, as materials of one final product are known. Then purchasing department makes orders to suppliers according to the result. However, this way against the control on materials purchasing and inventory as a whole. Different kinds of product need materials of different kinds and quantities. Besides, it is hard to make sure suppliers have as many products as you order, or sometimes the price changes rapidly. Usually more materials are needed in storage in case of kinds of emergency circumstances. Hence, another planning mode which is based on materials rather than final products is more practical. This planning mode is not brand new, and it has been established in companies in EMEA & AG which also belong to IBM. The planners consider how much materials is used usually, and the proportion of each server, together with the supply ability of suppliers and market information, to decide how many each kind of material is needed. It is more practical and scientific.

(4) Enhance the communication

Building information sharing platform with sub-area sales representatives and offshore planning center of IBM and communicating regularly can enhance the communication with each department. Demand planning center gains information from sub-area sales representatives and other departments in the company, such as marketing department, warehouse manager, design department, etc. Then, after making demand plan, it gives the result to each relevant department as well as offshore planning center of IBM. Due to the geographical differences, it is hard to communicate with each other directly. Hiring professional translators or employees understanding a secondary language is a good way to solve language problem. Considering the long distance, meeting face-to-face will be very expensive. Taking good use of advantage of IBM information system and remote meeting software would reduce costs.

(5) Improve the planning function in demand planning center

Demand planning center should responsible for the performance of demand planning in the company as a whole. That is, demand planning have to take in charge of entire demand planning. Multiple planning is a significant factor to cause failure. It should be avoided that if demand planning goes wrong, every department does analysis and try to show it is not their fault. Company could improve the working skills of employees in demand planning center through training. Meanwhile, it can send employees each sales area regularly, to enhance the communication with salesmen. Hence, employees in demand planning center will acknowledge the information of market and consumers, and demand plan they make will be more practical and useful.

(6) Build process to deal with emergency orders
In a buyer’s market, in order to keep the position in market, customer demand is above everything. Company tries its best to fulfill customer orders, no matter how hard the order is. As the case company has a two-week planning cycle, emergency orders, which are out of plan, keep increasing. To deal with it, as long as the order is confirmed, purchase request is input immediately into fulfillment purchase requisition database. Then the order goes to purchasing department after approval. Purchasing department sends order to suppliers. At the same time, system will track the whole process and remind related employees when one process is finished.

(7) Improve production capacity planning

As a manufacturing factory, ISTC faces an important problem as many other factories, that is, production changes a lot during one month. Generally, the production is low at the beginning of month, and increase rapidly at the end of month, due to the delay of supply or orders. In order to manage production and fulfill orders better, it is important to evaluate production of different periods and arrange it more scientifically. The manufacturing process costs a lot, and poorly controlled production will lead to the waste of human resource as well as influencing the fulfillment of orders. As the result of production capacity planning is an important reference data for demand planning, it can directly impact the performance of demand plan. Improve production capacity planning can improve the performance of demand planning at the same time.
Conclusion

The purpose of this thesis is to find the key factors and obstacles in demand planning process both in theory and practice, and solutions for the obstacles. One part of the purpose is to find out the key factors and obstacles in successful global supply chain management in manufacturing industry. The server manufacturer named ISTC is chosen as case. The facts of interview are integrated in findings part. We can conclude the demand planning process of ISTC or other companies like it as following: The planning cycle is no longer than 1 month. The demand planning process is interrelated with organizational functions such as Marketing and Human Resources as promotional activities need to be planned as well as personnel aligned. The demand plan is based on multiple inputs—from the sale, marketing, and statistical analysis. The key factors and obstacles shown in the cases are compared with theory. New key factors, obstacles, planning process and new description of them are worked out through comparison, analysis and discussion.

The key factors of the demand planning process are relationship with supply chain partners, information technologies and forecasting model, the quality of input data, information communication within corporation, demand planning cycle, innovation, high-quality employees, reasonable performance evaluation and customer satisfaction survey. Innovation, high-quality employees, reasonable performance evaluation and customer satisfaction survey are four new key factors that have not been shown in most research. The functions of relationship with supply chain partners, the quality of input data and demand planning cycle have been added new information in. They are shown in the table in analysis part. The understanding of forecasting model also been changed by the facts in the case. What the case emphasizes is a comprehensive planning system, forecasting model included.

There are five key obstacles of demand process: market dynamic, cross-use of multiple information systems, bullwhip effect, emergency orders and geographical differences. Among them, emergency orders and geographical differences are what we conclude from case study. Emergency orders cause chaos in demand planning process, while geographical differences seriously influence information sharing, and both of them will result in poor performance of demand planning. In the case, cross-use of multiple information systems and emergency orders are those can impact demand planning process directly. Information system security/breakdown, which is treated as a key obstacles in theory part, turns out to be less important according to case study.

The other part of the purpose is to figure out a way to improve the original demand planning process based on the key factors and obstacles in the case. In the end, seven possible solutions have been put forward based on the key factors and obstacles: simplify operation system; reducing planning cycle based on the simplified system; change original planning mode; enhance the communication; Improve the planning function in demand planning center; build process to deal with emergency orders; Improve production capacity planning.
Theoretical Contributions

This research provides a comprehensive analysis of key factors and obstacles in demand planning process of manufacture industry, both from theoretical review and empirical study, as well as improvements and solutions. New key factors and obstacles which have not been mentioned or analyzed before are proposed, in order to fulfill the gap of research in this area.

Managerial Implications

Compared to the great needs for demand planning, the research or guide about how to deal with it is insufficient. Our thesis provides a good example or recommendation for managers in charge of supply chain in multi-national enterprise. On the one hand, we find key factors and obstacles in demand planning, so managers would know what is important and what should avoid when they build the demand planning system. On the other hand, we propose some improvements and solutions based on the key factors and obstacles, helping managers in case they meet any problem discussed in the thesis. The research will be beneficial for company to make accurate forecasting, avoid multiple demand forecasting and plan system’s closeness to market, satisfying customers and fast delivery. It also gives the managers of the companies like ISTC important information for their demand management.

Limitation and Further Study

In the study of demand planning process, many literature mainly talking about long term planning. We use these theories to make a general process for the company like ISTC whose planning cycle is shorter than one month. It will lead to a lack of reliability in theory. In methodology, we use no questionnaire for data collection. It leads to a lack of data support. More data support can make the article more reliable. There is just one server manufacturer chosen as a case. It cannot represent all others kind of industry. The outcome of this research is mainly suitable for server manufacturing business.

Based on the limitation above, the further studying should concentrate more in the following sections: choose more companies in different industry for universal theory; and use more different methods for case study and more data support.
**Reference:**


Baumgarten M. (2010), *Paradigm Wars-Validity and Reliability in Qualitative Research*, GRIN Verlag


Council of Supply Chain Management Professionals (CSCMP),
http://cscmp.org/ (2012.05.02)


Denzin, N. K., Lincoln, Y. S. (2005), The Sage Handbook of Qualitative Research, Sage Publications.


Gartner: http://www.gartner.com/newsroom/id/2580515


Gillham B. (2000), Chapter 1: The nature of interview. In The research interview, Continuum International

Global Supply Chain Management Forum (2005), TOYOTA: DEMAND CHAIN MANAGEMENT, CASE: GS-42, DATE: 3/18/2005


IBM 2012 Annual Report


Murray N., Hughes G. (2008), Chapter: 6: what are the different components of a research project. In *Writing up your university assignments and research projects: A practical handbook*, Open University Press


Singh Y.K., Nath R. (2010), Research Methodology, APH


International Thompson Business Press, Boston, MA.

Thomas H.D. (2013), Competing on Analytics, To Make the Best Decisions Demand the best data.


