Turun yliopisto
University of Turku

ASSESSMENT OF AN INDUSTRIAL FIRM'S DEMAND PLANNING PROCESS

Master's thesis in Logistics

Author:
Essi Annala

Supervisor:
D.Sc., D.Sc. Juuso Töyli

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This research was a memorable journey for me. As any other Master's thesis worker, I started my writing process with a great amount of anxiety and uncertainty. However, step by step, I was able to increase my understanding on the subject I was researching. Through this, I gained confidence and motivation which lasted all the way to the end. During my writing process, I received encouragement and inspiration from numerous people whom I now want to say thank you to and express my gratitude to. First of all, I wish to give a special thank you to my supervisor at the case company and my supervisor at Turku School of Economics, Juuso Töyli. Both of them have provided me with excellent guidance and the support I needed with this research. Second of all, my gratitude goes to the support group I had at the case company and the thesis group at my university. Each person in my support group provided me with much needed feedback and supportive comments throughout the research. A special thank you goes to the global sales and operations planning manager, as he guided me to the correct direction along the way, starting from the very beginning. My thesis group at Turku School of Economics as well was extremely supportive from start to finish. All of us within the group were thesis writers; therefore we truly wanted to help one another.

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ATP	Available-to-promise
BIP	Business intelligence portal
BU	Business unit
CFO	Chief financial officer
CPFR	Collaborative planning, forecasting and replenishment
DCM	Demand chain management
DM	Demand management
EDI	Electronic data interchange
ERP	Enterprise resource planning
GSCF	Global supply chain forum
KAM	Key account manager
MAPE	Mean absolute percent error
MDR	Market data repository
MRP	Material requirements planning
MRPII	Manufacturing resource planning
MTO	Make-to-order
MTS	Make-to-stock
OEM	Original equipment manufacturer
POS	Point-of-sale
R&D	Research and development
SCM	Supply chain management
SKU	Stock keeping unit
SOP	Sales and operations planning
T&Cs	Terms and conditions
VMI	Vendor managed inventory

1 INTRODUCTION

1.1 Background of the study

In the modern world, globalization and endless competition dominate everyday business. Companies face new obstacles and are forced to find ways how to respond to the continuous change and uncertainty if they want to keep up with the competition. (e.g. Muzumdar & Fontanella 2006, 35; Crum & Palmatier 2003, 1–2.) Understanding, estimating and managing market demand is a central determinant of business success in a turbulent economy (Langabeer 2000, 66). Also a major question for every manufacturing corporation is how to plan their activities in order to achieve competitive advantage in the customer driven business culture. It is becoming increasingly more difficult to achieve customer's performance expectations, because customers have become more demanding and less forgiving. While product life cycles get shorter, customers require fast, on-time deliveries and expect flawless customer service as well. (e.g. Muzumdar & Fontanella 2006, 36; Crum & Palmatier 2003, 2; Simatupang & Sridharan 2002, 15.) More customized products and higher delivery frequencies are expected as well (Hvolby and Trienekens 2002, 3).

The growing speed of change in the markets sets new requirements for the management of demand supply networks (Kaipia, Korhonen & Hartiala 2006, 97). Maintaining an efficient and flexible supply chain is vital for every enterprise (Gupta & Maranas 2003, 1220). It is no secret that most companies are struggling with even the basics of balancing demand and supply. And quite often the result is excess inventories for some products and high shortages for others. Several researchers acknowledge this fact, as do the companies themselves. (see e.g. Kaipia 2008, 124; Muzumdar & Fontanella 2006; Quinn 1998.) According to Crum and Palmatier (2003, 2) the majority of companies in most industries have been challenged to think ways how to create beneficial partnerships. They have discovered that successful collaboration starts with effective internal demand management processes that are integrated with the company's planning processes. *The demand management (DM) process* concentrates on fulfilling customers' wishes, which is not a simple task to do.

Researchers and companies have been starting to explore the true depth of DM not very long ago as there has been much confusion about the term in the business community. DM is considered as a somewhat abstract and complex concept that is connected to several different departments, such as sales, marketing, finance, production and logistics. Partly for these reasons, the concept has been ignored by management and strategists for a long time. (Lapide 2006, 17; Langabeer 2000, 68.) According to Croxton, Lambert, García-Dastugue & Rogers (2002, 51) the DM process is a supply chain pro-

cess that is about balancing the customer's requirements with the capabilities of the supply chain. It has a significant impact on the profitability of a firm, its suppliers and customers. The process does not only mean *demand forecasting*, whilst it is one of the most important elements of DM (e.g. Mentzer and Moon 2004, 41). Included are also synchronizing supply and demand, increasing operational flexibility, reducing variability and coordinating marketing requirements, to name a few (Croxton et al. 2002, 51). *The sales and operations planning (SOP) process* is often described in much the same way as the DM process: the process of matching demand and supply in the most efficient way (e.g. Muzumdar & Fontanella 2006, 35; Mentzer & Moon 2004, 43). However, this thesis follows the conception of Lapide (e.g. email 23.11.2011; 2007b; 2006), among others, who is strongly of the opinion that SOP is one tactical planning process within the wider context of DM. Similarly, Croxton et al. (2002, 57) consider SOP as one process of DM where the demand forecast is synchronized with the supply chain's capabilities.

It has become a necessity for organizations to plan their activities and to cope with uncertainties and risks of different nature that occur in the supply chain. In creating an efficient supply chain, sharing and receiving information to align supply and demand is vital. (Kaipia 2009, 153.) *Demand planning* is one vital part of DM and is mainly the responsibility of the company's sales department (Lambert 2004, 22). It is often considered to be the starting phase in SOP. The process of demand planning is in the focal point of this research. Kaipia (2007, 18) defines demand planning as the process that captures information on market demand and further combines it with supply capabilities and constraints to develop a plan for future demand. In this thesis the aim of demand planning is somewhat similar to Kaipia's definition. Namely, demand planning refers to the planning activities at the demand side that aim for the understanding of future customer demand. Forecasting is considered as one important component in demand planning, as through forecasting the company is able to receive a quantitative assessment about the upcoming demand. Demand planning results in *a demand plan* that gives insight to the company on how much and where to sell the manufactured products. Supply capabilities are not taken into consideration when creating the demand plan, as the supply plan is a separate issue that follows after the demand plan is created.

Further, *supply chain planning* is brought to the forefront of business practices in most service and manufacturing organizations because of the increasing competitive pressures and fast advances in information technology. One definition reads that supply chain planning is a specific supply chain coordination mechanism that can be described as the coordination and integration of key business activities in an organization, from the procurement of raw materials to the distribution of the end products to the customer. Efficient integration of the often conflicting objectives of various business functions, such as marketing, purchasing and manufacturing, is the primary goal of supply chain

planning. (Gupta & Maranas 2003, 1219.) Kaipia (2007, 19) even considers supply chain planning practically equal with DM related activities. Therefore, it is essential to clarify the concept of SCP as well. Many organizations might ask themselves if processes within DM are worth all the effort. But given today's competitive market environment, they should better ask themselves whether they can afford not to implement an effective DM process. (Crum & Palmatier 2003, 23.) Langabeer (2000, 66, 72) adds that only few organizations have undertaken a profound analysis of demand and acted upon its strategic potential. However, firms that are serious about improving their performance should start by thoroughly understanding demand.

1.2 Research problem and limitations

The research problem in this study is *to identify improvement suggestions in the demand planning process for stable products which may assist the case company to achieve a more accurate demand plan.* Through this, the entire DM process will produce improved results. The research problem can be divided into the following two specifying questions:

1) *How does the demand planning process work currently with stable products in the case company?*
2) *How can the demand planning process be improved in order for the case company to achieve a more accurate demand plan?*

This thesis is written on assignment by a global technology organization that operates in more than a hundred countries. This study is specifically limited to researching one particular profit unit in Finland within this organization. The researched profit unit is referred to as the case company. In order to understand the context of this study, it needs to be emphasized that the case company sells its products to internal customers. Therefore, sales managers are not in direct contact with end customers, but with other local companies of the same organization around the globe. This fact is bound to create challenging elements when planning demand in the case company. Moreover, although this study focuses on the profit unit in Finland, it needs to be acknowledged that the case company cannot be isolated from its global context. Namely, the case company has a few sister factories. The sister factories impact the business in Finland and in this research, they are regarded as customers. The idea is that when, for instance, the case company is facing difficulties in meeting the prospective demand, a sister factory that at the moment has excess capacity may assist the case company to meet this demand by sharing their manufacturing capacity.

This study is a part of the SOP project currently taking place in the case company. There is a strong urge to improve operations relating to demand supply matching in the case company and this thesis centers particularly on the sales department and the demand side of operations. Even though supply planning, production planning and distribution planning each have their own role in DM, they fall outside the scope of this research. This thesis is limited to researching demand planning as one part in the DM process. However, in order to form a complete view of the process, several departments within the company are included in this research. For instance, the supply side of operations will be discussed in the empirical part when explaining what kinds of challenges are experienced when matching demand with supply. The case company aims for having the necessary tools and information to form an accurate demand plan. Demand forecasting provides quantitative assessments about future demand. In demand planning the forecast is combined with other inputs. In this study, forecasting is being approached mainly by studying how the forecasting process works; what information is being used to create forecasts, who are involved in the process and what could be done differently. The statistical tools used to create forecasts are studied only to a minimal extent. However, the author finds it important that demand planning is discussed by explaining its larger context to begin with. Therefore, this thesis will give a complete theoretical framework of the DM process.

Products in *the stable phase of their life cycle* are in center of this research. Ramp-up products, referring to new product introductions, and ramp-down products, indicating products that are at the end of their life cycle, are being left outside of the scope in this research. Varley (2001, 59–60) defines the stable phase as the maturity life cycle phase where a large assortment of the product is offered, including many product variations. The product becomes established in the marketplace, price becomes an important selling feature and distribution occurs over a wide range. The case company manufactures according to make-to-stock (MTS) and make-to-order (MTO) strategies. In MTS strategy, products are delivered directly from stock, referring to "push type" manufacturing. In MTO, on the other hand, products are manufactured according to "pull type" manufacturing; products are manufactured only when there is actual demand for them. Therefore, these two manufacturing strategies will be taken into notice when discussing demand planning issues. This thesis provides the case company with an opportunity to review their current demand planning process and advance it further. As for the theoretical implications, the concepts of DM, demand planning and supply chain planning will be clarified. The results are meant to assist the case company with their demand planning activities and are not intended to be generalized to other companies. However, this research may provide theoretical advice to them as well. The scope and aim of this research is depicted in the below Figure 1.

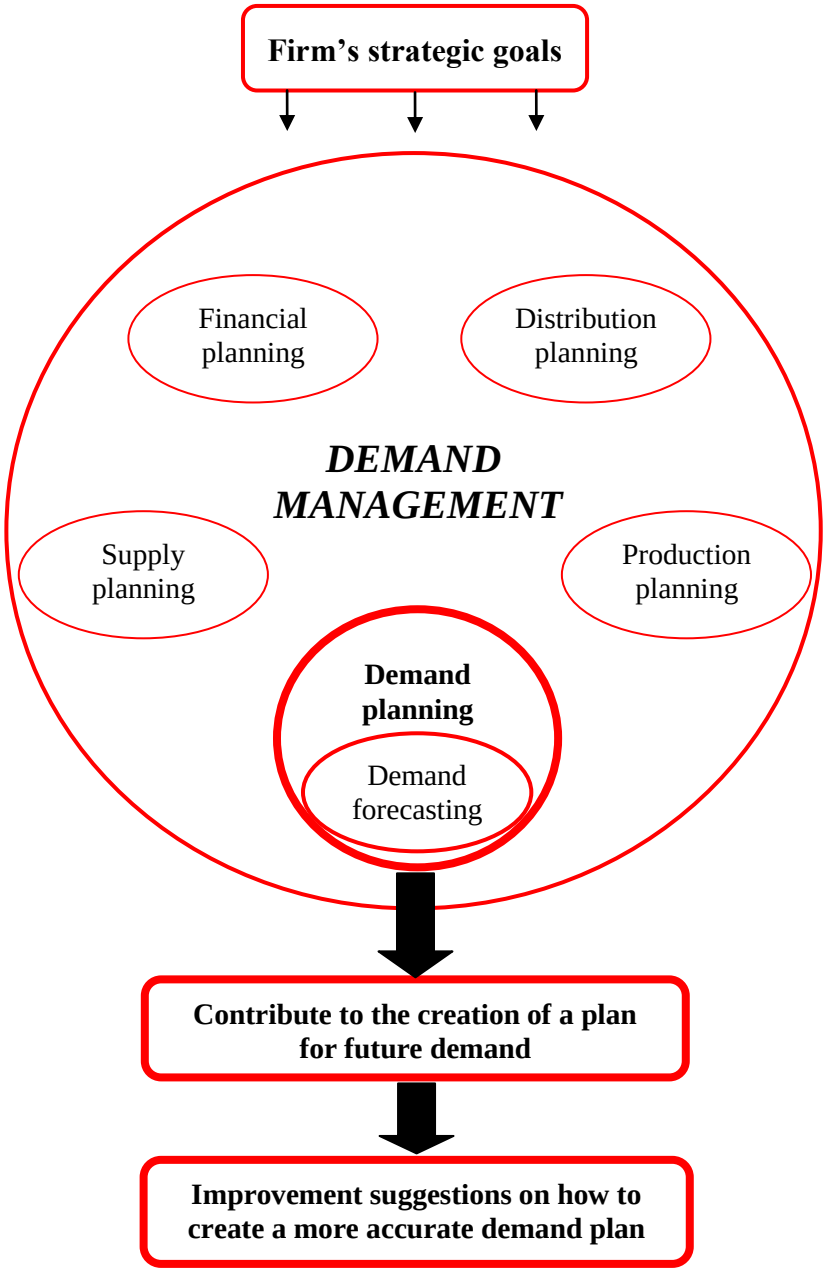

Figure 1 The scope and aim of the research

After having conducted the research, the author will have formed an image about the current situation of demand planning in the case company. As a following and final step, the author will give improvement suggestions on how the case company is able to advance their demand planning process further and thus, create a more accurate demand plan. By achieving this, the whole DM process will gain better results.

1.3 Structure of the thesis

This research is divided into eight chapters. The study approaches the subject of demand planning by starting from the wider concept of DM. To begin with, Chapter 1 is the introduction that explains what is being studied and to what extent. The theoretic aspects that the author has chosen to support the empirical research are introduced in Chapters 2, 3 and 4. Chapter 2 introduces the whole concept of the DM process. The several definitions for it are introduced, the outcomes when the process is not working effectively are briefly discussed, and what types of challenges are related to demand supply matching activities are described. Success factors for the whole process are presented as well. Following Chapter 3 covers the concept of demand planning. The process itself is defined, tools for advancing the process are discussed and demand forecasting as one element is explained. The demand planning processes in the MTS and MTO environments are briefly described next, along with the wider area of supply chain planning. Final theoretical Chapter 4 entails a synthesis of the main findings from literature that support the empirical research.

From Chapter 5 begins the empirical part of this thesis. Chapter 5 explains the methodology of this study. Discussed are the following topics: research methods and strategy, research process, and the concepts of reliability and validity. Chapter 6 deals with the empirical findings. First, general information concerning the case company is presented. Second, the current demand planning process in the case company is described: how people view the process, who are involved, how does demand forecasting work and what types of uncertainties may be identified in demand supply matching activities. Chapter 6.3 summarizes findings from the comparison with one of the case company's customer organizations. Fourth, the author presents improvement suggestions for the case company: new conception of the entire process, who should be involved and how to advance demand forecasting practices. Following Chapter 7 draws the conclusions about the research, summarizes main demand planning issues of this research and provides suggestions for further research possibilities. Final Chapter 8 briefly summarizes the entire thesis.

2 DEMAND MANAGEMENT

2.1 The demand management process

2.1.1 Definitions and purposes

As this study centers around one element in the DM process, it is essential to start defining significant concepts from the beginning. The term *process* is defined by Davenport (1993, 5–7) as a structured and measured set of activities designed to produce a specified output. Processes are of dynamic nature and they emphasize how work is being done within a company. They can be thought of as the structure by which a company does what is required to produce value for its customers. The DM process is a wide concept and in order for it to have the desired effect, it needs inputs from several different functions within and outside an organization. Several researchers have acknowledged the importance of the DM process and therefore, have created their own definitions for it (cf. Crum & Palmatier 2003; Croxton et al. 2002; Lambert & Cooper 2000; Cooper, Lambert & Pagh 1997). However, most definitions have the same underlying basic idea: it aims at balancing supply and demand in the best possible way. Several terms used to describe demand supply matching have been used in literature as well. For instance, Kaipia (2007, 18–19) approaches DM by using the term supply chain planning. Demand planning is also often discussed when actually referring to DM. Demand planning is, nevertheless, only a part of DM. But perhaps the most important point to be made here is that SOP should not be confused with DM, as it is only one process in the broader DM context. SOP is the process that enables an effective means for synchronizing the demand plan with the supply plan. SOP brings all the several different departments within a firm together and through this, mutual understanding about demand and supply can be achieved. Demand planning is often positioned as being the first phase in the SOP process. DM, on the other hand, is the concept that includes every single aspect of balancing demand with supply (e.g. Lapide 2011). For instance, in addition to SOP, reducing demand variability and increasing operational flexibility are considered to be elements in DM.

Cooper et al. (1997, 10), two of whom are members of the Global Supply Chain Forum (GSCF), describe DM as one of the eight *supply chain management (SCM)* processes. *A supply chain* consists of interdependent firms involved in the flow of goods, services and information from point of origin to the end customer (Simatupang & Sridharan 2002, 16). It can be regarded as a network of companies with some commonly shared goals (Stadtler 2005, 577). Among numerous conceptions of SCM, a widely

known definition of the term was developed in 1994 and modified in 1998 by members of the GSCF. It states: "Supply chain management is the integration of key business processes from the end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders." In being one of the eight SCM processes DM requires interfaces with the other seven. The seven other SCM processes include customer relationship management, customer service management, order fulfillment, manufacturing flow management, supplier relationship management, product development and commercialization, and returns management. (Cooper et al. 1997, 10.) These become supply chain business processes as they are integrated internally and externally with key partners in the supply chain (Lambert, Cooper & Pagh 1998, 1–2; Lambert & Cooper 2000, 66). However, in many companies executives struggle to achieve the necessary level of integration. This is related to the fact that they do not fully understand these processes. Nevertheless, while several authors have suggested implementing business processes in the context of SCM, there is no industry standard on what these processes might be. (Lambert 2004, 19–20.) These eight processes are only one opinion and not a widely agreed mutual understanding, at least not yet.

It should be pointed out, that a wide range of researchers (see e.g. Hilletofth 2011; Walters 2008; Jüttner, Christopher & Baker 2007; Langabeer 2000) have recognized that companies have both a demand chain and a supply chain. According to Langabeer (2000, 68–70), all activities within the demand chain focus on DM, thus the demand chain can be seen as a collection of activities and processes which individuals and groups use to manage and pull demand from the market. Hilletofth (2011, 184–185) argues that the demand chain is managed within demand chain management (DCM). And naturally, the supply chain is managed within SCM. Walters (2008, 701) states that SCM has focused on moving products and services downstream the supply chain, towards the customer. Jüttner et al. (2007, 381, 389), on the other hand, define DCM as the concept that aims for the integration of demand and supply oriented processes. This definition contains the idea of combining the strengths of marketing and SCM by designing customer driven supply chains and moving the focus to the customer. As demand chains evolve, organizations will focus more on integrating valuable business intelligence, such as demand signals from the market, to address the strategic decisions that they face more effectively (Langabeer 2000, 71).

Croxton et al. (2002, 51), also members of the GSCF, further developed the work started earlier by the GSCF concerning the eight SCM processes. They describe DM as a process that tries to create a balance between two sides: the demand from customers and the capabilities of the supply chain. According to Croxton et al., the main elements in DM are demand forecasting and synchronizing the forecast with capabilities of production, procurement and distribution. Krajewski, Ritzman and Malhotra (2009, 484)

define the concept of forecast as thus: "*A forecast* is a prediction of future events used for planning purposes". Croxton et al. (2002, 51) continue that the aim of a well-established DM process is to proactively respond to demand. Lapide (2006, 18) agrees by commenting that reacting to demand is not enough. Nevertheless, it is important for a company to be more reactive to unanticipated demand as well. Namely, an important element of DM is to find ways to reduce demand variability and increase operational flexibility. *Demand variability* means occurring repeatable deviations from the average demand. (Croxton et al. 2002, 51, 62.) One should understand that seasonality itself does not mean variable demand, as it occurs regularly (Crum & Palmatier 2003, 138). Many people consider this "lumpiness" as the greatest enemy of planning. However, as most of the customer driven variability cannot unfortunately be avoided, one part of DM is to eliminate management practices that increase variability. Another part is to develop and execute contingency plans when the operational plans are interrupted. (Croxton et al. 2002, 51, 62.) Upton (1994, 73) defines *flexibility* as the ability to react or change with minimum penalties in time, effort, cost and performance. With increased flexibility firms find it easier to respond quickly to internal and external events (Croxton et al. 2002, 51).

Lapide (2006, 17) states that activities within DM are an important part of SCM and integrated SCM processes can be recognized as a weapon with which to gain competitive advantage. Lapide (2006, 17; 2007b, 8) defines DM as matching of demand and supply over time. The phrase “over time” is important, because it means DM processes are included in three different planning horizons:

- long-term
- medium-term
- short-term.

Fleischmann, Meyr and Wagner (2002, 72) explain that strategic planning decisions over several years are being made at the long-term level, the outline for regular operations over 6 to 24 months are determined at medium-term planning level, and detailed instructions for immediate action are specified at short-term planning level. The time periods within each planning horizon, however, may naturally vary between companies. Managers that deal directly with customers typically set certain terms and conditions (T&Cs) that they use with each customer. For instance, they might apply special pricing to certain customers. Some T&Cs have a direct impact on demand, such as special delivery requirements, co-managed inventory programs and sharing downstream information such as point-of-sale (POS) data. (Lapide 2006, 18.) *POS data* records actual customer purchases of the final product and when such data is shared with suppliers, planning may be facilitated and uncertainty reduced (Krajewski et al. 2009, 394). The setting of various T&Cs represents *the long-term* aspect of balancing supply and demand. In addition, managers often segment the customer base so that they are able to

provide different levels of service to each segment. Such customer service segmentation is a vital process in matching supply and demand in the long run as well. (Lapide 2006, 18.)

Medium-term planning processes involve balancing current, and also future, supply and demand on a medium-term basis. For example, new product launch and promotional campaign planning are important medium-term planning processes. According to Lapide (2006, 18–19), SOP represents one of the medium-term DM processes to which demand forecasting brings critical input. In SOP there is a need to quantitatively and qualitatively estimate the impact from different sales and marketing plans, and what kind of supply is required to meet the prospective demand. Muzumdar and Fontanella (2006, 35) state that when applied correctly, SOP may benefit every company regardless of their size. *Short-term* planning processes involve simply matching supply and demand in real time. Lapide (2006, 18) considers this to be a key responsibility of sales personnel in a company. Estimating a delivery date for a customer's order represents an opportunity to match supply and demand in the short term. It requires planning for each order's fulfillment process which means assessing what supply is available now and what in the future to meet the demand. In addition, when scarce supply needs to be allocated, customer priorities need to be taken into account. (Lapide 2006, 18.)

Lapide (2007b) continues by stating the following: "Typically, supply and demand managers are on opposite sides of a Grand Canyon –sized chasm." The managers on the supply side are focused on minimizing costs and inventories, while the managers on the customer side concentrate on maximizing revenues. Jacobs (2006) as well as Mentzer and Moon (2004, 39) agree by commenting that supply and demand logics need to be balanced one way or another. Hilletofth (2011, 185) approaches this issue with the term demand-supply chain management (DSCM). The goal of DSCM is to increase understanding on how to manage the demand and supply chains, and how to coordinate them. Again, several others (see e.g. Walters 2008; Mentzer & Moon 2004) agree on the underlying principle of DSCM; coordination of the demand-side and supply-side processes. Managers on the demand side often make decisions about segmentation or customer service policies, such as delivery requirements, without sufficient input from supply chain managers. Processes within DM are there to bridge the wide gap between these supply and demand managements. For this to successfully work, more joint and coordinated decision making among the supply side and demand side managers is required. (Lapide 2006, 18; 2007b.) In the below Figure 2, Lapide (2006, 19) introduces his view on how the processes within DM context should interact with each other.

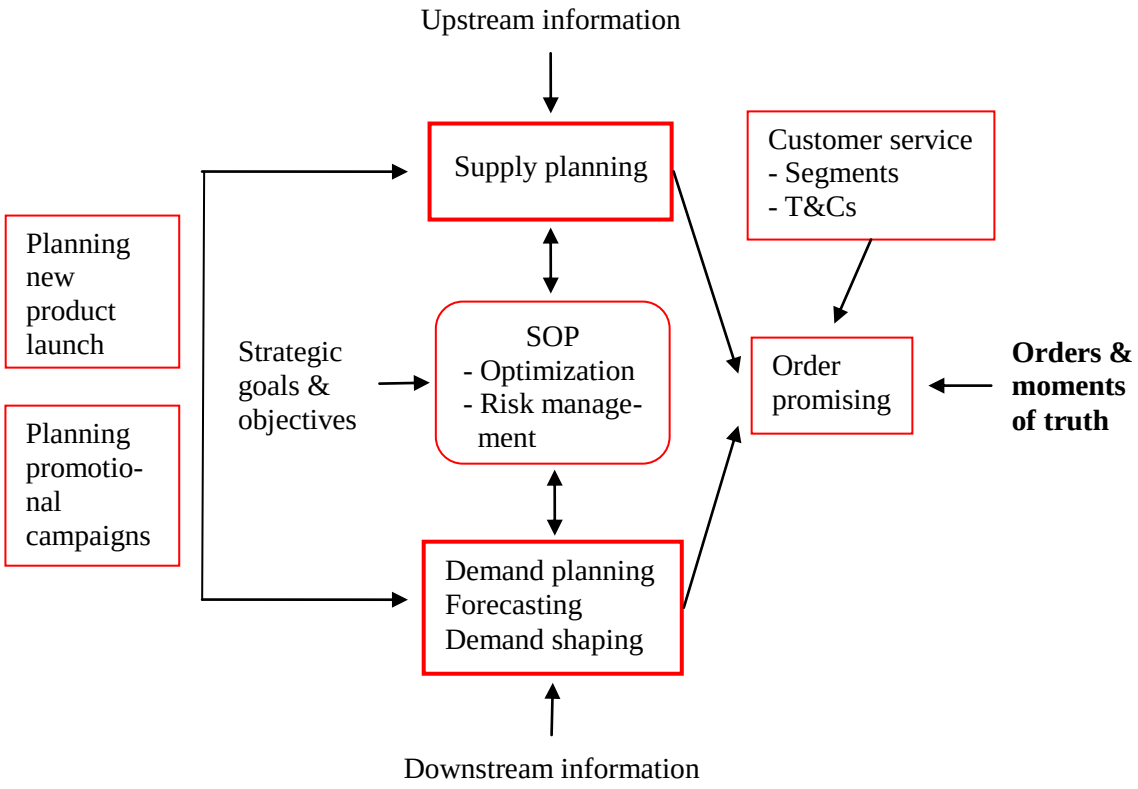

Figure 2 The integration of DM processes (adapted from Lapide 2006, 19)

The figure illustrates Lapide's conception on SOP; it is the connective factor between supply and demand sides. All other processes in the above figure either contribute to the planning of demand or supply, or they are outcomes of these planning processes. The moment of truth for a supply chain occurs when demand is recognized in the form of the actual customer order. It is at this point when the organization needs to be ready to fill the order. In other words, the supply needs to be ready to match the actual demand. This moment tests all the planning that has taken place in anticipation of actual demand. (Lapide 2006, 19.)

Crum and Palmatier (2003, 12) define DM as an ongoing and still evolving process that is the responsibility of marketing and sales management. The process, nevertheless, impacts most functions within the company as well as its trading partners. The researchers explain that the goal of DM is to turn the forecast into a demand plan. They have presented a model that consists of the following elements: planning, communicating, influencing, and managing and prioritizing demand. By integrating these elements, a complete view of the DM process may be created. *Planning demand* is the first step. It can be described as a re-planning process, as every month the supporting assumptions concerning future demand are updated, revised and agreed upon. The second step of *communicating demand* includes communicating the demand plan to the supply and finance departments and in an increasing amount also to supply chain partners. It requires an organized structure for passing information on, discussion, decision making

and feedback. Third phase, *influencing demand*, includes using marketing tactics, product positioning, pricing and promotions to influence demand, to name a few. (Crum & Palmatier 2003, 4, 10–12, 28, 47, 59–60.) Nielsen, Nielsen and Steger-Jensen (2010, 870) comment that when changing some product characteristics, for example price or delivery time, it may help in manipulating customer behavior in a way that benefits the manufacturer. However, it is not a simple task to influence demand because customers, markets, competitors and the economy are constantly changing, and customers have already a firm mindset about what they desire (Crum & Palmatier 2003, 59). In fact, when thinking about the industry characteristics where the case company operates, it becomes clear that influencing demand is nearly impossible. The case company's customers order products for specific types of applications and these products need to be precisely suitable. Thus, influencing demand becomes a somewhat impossible task. *Prioritizing and managing demand* is the final phase in this model. The aim for prioritizing demand is to manage for optimum demand performance from the demand volume, sales revenue and customer service points of views. A typical situation when demand managing and prioritizing is needed occurs when supply constraints make it necessary to adjust the demand plan accordingly. (Crum & Palmatier 2003, 73–74.)

Further, Moreira (2009) argues that DM is an essential lever in the procurement process for reducing costs and in improving efficiency. This requires controlling of demand and distinguishing between "needs" and "wants". Needs are essential to the critical outcome of a task, wants are not. Wants should therefore not be allowed to become habits as they only increase operational costs. Kotler (1997, 15) holds the view that DM is essentially a synonym with the term called marketing management. Marketing management involves influencing the level, timing and composition of demand in a way that will help a company in achieving its goals and objectives. Langabeer (2000, 68–69, 71) is of the opinion that the definition of DM is still evolving. To begin with, organizations need to understand that DM is not equivalent to demand forecasting. The evolution of DM has started from a tactical approach where primary emphasis was on sales planning, followed by operational phase where the focus was on sales and supply chain planning. The final phase is a strategic orientation towards DM; the integration between strategic decisions and lower-level operating processes is the focus. Companies have only a short while ago started to explore the depth of DM since it has been considered as a complex and abstract concept and therefore ignored by managers. However, step by step, companies are beginning to use DM more strategically and they begin to understand that DM can have an effect on a firm's entire operations. Mentzer and Moon (2004, 41) explain that the role of DM is often to decrease demand, as there may be demand for products at levels that a company simply cannot meet. With the help of the DM process, an organization can gain substantial savings. In order to clarify how DM is discussed in the literature, the definitions for the process have been summarized in the below Table 1.

Table 1 Summary of definitions for DM

Author(s)	Definition for demand management process
Kotler (1997, 15)	DM is essentially a synonym with the term marketing management. Marketing management involves influencing the level, timing and composition of demand in a way that will help the company in achieving its goals and objectives.
Cooper, Lambert & Pagh (1997, 1998)	DM is one of the eight essential SCM processes and requires interfaces with the other seven. By understanding the key SCM processes managers can bring their firm more revenue and profitability.
Langabeer (2000)	The definition is a complex and abstract concept that is still evolving. All activities within the demand chain focus on DM. DM can have an effect on the firm's entire operations and it should be used at the strategic level not only to capture a forecast but also to create a collective probable scenario for the future. Step by step, companies are beginning to use DM more strategically.
Croxton, Lambert, Garcia-Dastugue & Rogers (2002)	DM is an important supply chain process that tries to fit customers' requirements together with capabilities of the supply chain. Focus is on forecasting customer demand and synchronizing forecasted demand with capabilities of the supply chain.
Crum & Palmatier (2003)	DM is an ongoing and still evolving process that is the responsibility of marketing and sales management in a company. The goal is to turn forecast into a demand plan. A complete view of DM consists of four elements: planning demand, communicating demand, influencing demand, and managing and prioritizing demand.
Mentzer & Moon (2004)	DM is one element in SCM and it consists of much more than forecasting. The term, and even the concept of demand itself, is not well understood among supply chain managers. The role of DM is often to decrease demand, not only to increase it. With the help of DM process, an organization can gain substantial savings. The most savings can be achieved when there is collaboration between all companies in the supply chain.
Lapide (2006; 2007b)	Processes within DM are an important part of SCM. The term refers to matching of demand and supply in the long-term, medium-term and short-term. DM processes bridge the gap between supply and demand managements. The focus is on matching the supply plans with demand plans.
Kaipia (2007, 18–19)	DM is practically equal with supply chain planning. The terms mean activities that focus on evaluating demand for required capacity and material. Primary goal is effective integration of often conflicting objectives of various business functions, such as marketing, purchasing and manufacturing.
Moreira (2009)	DM is an essential lever in the procurement process for reducing costs and in improving efficiency. This requires controlling of demand and distinguishing between necessary "needs" and unnecessary "wants".

2.1.2 Consequences of an ineffective demand management process

While a successful DM process is expected to improve a company's financial performance and market position, an ineffective DM process leads to weakening of market and financial status of the company. An organization with ineffective DM is not able to synchronize the demand and supply plans. From this follows the ultimate and most obvious consequence of an ineffective DM process; the company fails to successfully match demand with supply. This leads to customer dissatisfaction because the level of service is not optimal. There is a large possibility in losing customers to competitors because of late order deliveries; the competitor may be ready to fulfill customer's needs better. (Crum & Palmatier 2003, 20, 22–23.)

Ineffective DM process causes the demand forecast accuracy to decrease. If the planning processes and data collecting are not being invested with sufficient time and effort, there is no possibility for the forecasters to even try to create accurate forecasts. When the demand forecast does not match with the actual demand and customers order more than has been predicted, not enough products are available to fulfill customers' wishes. This results in customer disappointment and a loss of sales in the worst case scenario. When customers order more products or change their preferences by ordering some different product instead of what has been forecasted, the organization is forced to change priorities with a short notice. This results in higher costs and reduced profitability. A company might manufacture products unnecessarily when customers do not place so many orders as what had been forecasted. Results of such incidents can be seen in the forms of increased inventory and increased carrying costs. Valuable, and perhaps even very critical, capacity is wasted when customers' orders deviate from forecasted volumes, as the company may be producing the wrong mix of products. (Crum & Palmatier 2003, 17–18.)

A typical supply chain professional spends a great amount of time and effort to expedite orders, check order status at frequent intervals and create buffer inventories. Activities such as these result directly from the facts that the supply chain lacks clear communication among all participants and the uncertainty factors in the chain have not been reduced. As uncertainty about the future prevails, managers need to find ways to buffer their companies against disruptive events. However, these may be regarded as merely extra effort for all managers when the DM process is ineffective. (Geary et al. 2002, 52–53.) Similarly, Childerhouse and Towill (2004, 587) continue in their research that the various types of uncertainties and instabilities cause the chain performance to become unpredictable. Therefore, it cannot serve the customers reliably. This may lead to lower market share, increased costs, and lower profitability. (Geary et al. 2002, 61.)

Successful SCM requires the integration of the key business processes of which DM is considered to be one. When the necessary integration between these processes is in-

sufficient or even non-existent, supply chain performance suffers and resources are wasted. And if an organization fails to implement the DM process, it can result in missed opportunities and poor decisions. (Lambert 2004, 26.) DM is a challenge for the whole company. Demand is the one and only factor that drives all company operations and supply that the company offers is there to fulfill this demand. When the upcoming demand cannot be fulfilled successfully, the company inevitably suffers. It can be seen, for example, in the form of inaccurate forecasts, excess inventories, deterioration of the company's market position, disappointed customers, frustration for example among production and sales personnel. There are numerous consequences which are related to one another as they arise from the same source: non-accurate and inefficient matching of supply and demand.

2.2 Challenges

2.2.1 Uncertainties related to demand management activities

Uncertainties related to DM activities can be identified from the perspective of what types of uncertainties have an impact on a firm's supply chain and through this, on demand supply matching activities. The concept of risk often arises when discussing uncertainties. Therefore, as it is uncertainties that are dealt with here, it is nevertheless important to recognize the difference between these two concepts. Knight (1957, 233–234) presents his understanding of the distinction between the concepts of risk and uncertainty. *Risk* is something that we can measure by presenting probabilities for a possibly happening event and *uncertainty*, on the other hand, is not a measurable concept. When thinking about risks, the probability of certain instances in the future may be known through calculation or statistics of past experience. In the case of uncertainties, it is not possible to measure the probability of an incident occurring in the future as the situation dealt with is truly unique. (Knight 1957, 233–234.) The measurable nature of risks is the reason why they are not being discussed here. Merely the types of uncertain events that cannot be measured are being clarified.

"Uncertainty rules the supply chain." This is how Geary, Childerhouse and Towill (2002, 52) emphasize the importance of uncertainty. Uncertainty creates challenges to companies that are impossible to ignore because some degree of uncertainty is present in every business organization. There are always unpredictable events and instabilities in the future one is not able to foresee. The rapid change in business environment, for instance, is one of the main reasons for uncertainty. (Kaipia 2008, 124.) Similarly, Koh and Tan (2006, 472) explain that the twenty-first century global competition has caused

the rapid response to uncertainty in many manufacturing enterprises. Supply chain professionals need to manage the consequences of the unknown on a daily basis and they often must seek safety mechanisms to protect against disruption (Geary et al. 2002, 52–53). Christopher (1998, 32), as do several others (see e.g. Geary et al. 2002, 53; Van der Vorst & Beulens 2002, 412), holds the view that one of the main reasons why companies carry safety stocks is because of uncertainty. It might be uncertainty about future demand caused by world's economic conditions or about a supplier's ability to meet a delivery promise. Uncertainty spreads throughout the network and causes inefficient processing and non-value adding activities. The safety buffers affect negatively on operational performance and therefore weaken the competitive position of the company. (Van der Vorst & Beulens 2002, 412–413.) The fact that organizations need to create buffers against uncertain events is the direct result of uncertainty caused by lack of visibility and clear communication along the supply chain (Geary et al. 2002, 52–53).

In practice, managers experience uncertainty in the supply chain in various forms and they might not be able to visualize the whole cause-and-effect of the supply chain uncertainty. This might lead to choosing only a semi-optimal business strategy instead of the best strategy to tackle the uncertainty. (Koh & Tan 2006, 483.) Van der Vorst and Beulens (2002, 413) define *supply chain uncertainty* as decision making situations in the supply chain in which the decision-maker does not know definitely what to decide. He lacks information or understanding about the supply chain, the environment or processing capacities. In addition, he is unable to accurately predict the impact of possible actions on supply chain behavior or he lacks effective control actions. Koh and Tan (2006, 473), alternatively, describe supply chain uncertainty to mean uncertainty that occurs in a production process. It generally means any unpredictable event in the production process that cannot be planned beforehand in a supply chain. Further, Geary et al. (2002, 55) have divided supply chain uncertainty into four types. Each of these types creates difficulties for a company's operational performance. The supply chain uncertainty types include (Geary et al. 2002, 55)

- demand uncertainty
- supply uncertainty
- process uncertainty
- control uncertainty.

Demand uncertainty in this classification is seen as the difference between real end-marketplace demand and orders placed by the customers. This type of uncertainty can be quantified by measuring how effectively companies meet customer demand. (Geary et al. 2002, 55.) Koh and Tan (2006, 473), on the other hand, define demand uncertainty as unpredicted incidents that occur in the downstream supply chain and it has a direct impact on the manufacturing cycle time, creating manufacturing uncertainty. Furthermore, Childerhouse and Towill (2004, 586) hold the view that demand uncertainty re-

sults from the lack of marketplace transparency or unexpected customer orders. It may be concluded that the environment and world's economic state have a direct impact on demand. Demand uncertainty is experienced in increasing amounts when economic conditions are unstable as this type of environment results in lack of transparency from the market. Many researchers (see e.g. Gupta and Maranas 2003, 1220; Croxton et al. 2002, 62) are of the opinion that in any manufacturing organization, the product demand creates the most uncertainty and is the most problematic of all the sources of variability. Failure to react to significant demand fluctuations might either lead to unfulfilled orders and therefore dissatisfied customers, or loss of market share and remarkably high investment costs (Petkov & Maranas 1998, 896). Demand variability, or according to Krajewski et al. (2009, 526) demand swings, are "more the rule than exception". If no actions are taken to even out demand, greater capacity cushions are needed. Kaipia (2009, 154) comments that due to the growing demand uncertainty at the product volume level the requirement for flexibility of manufacturing systems as well as entire supply chains is increasing. The competitive market situation requires companies to compete on differentiation and product innovation, which leads to uncertain future demand and greater requirement for flexibility.

Supply uncertainty is described as uncertainty that results from suppliers who perform poorly. Performance is regarded as poor when suppliers do not meet the organization's requirements and complicate the value-adding processes. Supply uncertainty may be evaluated for instance by looking at supplier delivery performance, actual lead-times, and supplier quality reports. (Geary et al. 2002, 55.) Similarly, Koh and Tan (2006, 473) define supply uncertainty as unforeseen events that occur in the upstream supply chain, for example late delivery from a supplier. This would result in the delay of the manufacturing process, thus creating manufacturing uncertainty. *Process uncertainty* influences a company's internal ability to meet a production delivery goal. The amount of process uncertainty may be determined when one understands the yield ratios of each work process and estimated lead-times for operations. (Geary et al. 2002, 55.) When thinking of the manufacturing processes in a company, uncertainty can result when some planned work is displaced to make way for a delayed assembly of another or the delay might be increased if a required resource cannot be found (Koh & Tan 2006, 474). Machine breakdowns can induce process uncertainty as required products may not be manufactured on time (Childerhouse & Towill 2004, 586). *Control uncertainty* is connected with the information flow, and the way a company transforms customer orders into production targets and raw material requests from suppliers (Geary et al. 2002, 55). Childerhouse and Towill (2004, 586) explain that outdated or incomplete information, as well as poor system controls, can cause control uncertainty. The amount of control uncertainty may be determined by comparing customer requirements, supplier requests to deliver, and the targets of production over the same time periods. Control uncertainty

could be completely eliminated when the company acted in a pure demand-pull environment, where the linkage between supply and demand would be clear. However, companies normally use order batching and lot-sizing, which blurs the linkage between the placed orders and true requirements from customers. (Geary et al. 2002, 55.)

This classification of four uncertainty types presented by Geary et al. (2002, 55) may be summarized into two main points. First, both demand and supply uncertainties have an effect on a company's own process uncertainty and how it is experienced. Secondly, control uncertainty in fact is the result of all other three types of uncertainties. Demand, supply and process uncertainties create the reason why a company suffers from control uncertainty. Childerhouse and Towill (2004, 586–587) introduce a concept called *the uncertainty circle*. The circle consists of the four different types of uncertainties described above; each type has an own segment in the circle. The circle demonstrates the fact that demand, supply, process and control uncertainties all create problems that affect the delivery performance of a company. To name a few, demand uncertainty in the form of market volatility affects the company's ability to fulfill orders, supply and process uncertainties cause uncertain deliveries, and control uncertainty creates difficulties for the firm's own internal order processing. All the occurring problems in the delivery performance are linked to each other via the four sources of uncertainties.

To conclude, it should be obvious that every supply chain professional and firm executive wants to reduce uncertainty in the best way that they can and continuously improve the way how they manage risks (Muzumdar & Fontanella 2006, 35). Nevertheless, there are always uncertain factors in the future that companies have little or no control over. One example is the uncertainty created by the environment and the world's economic state which greatly affects the degree of demand, supply, process and control uncertainties experienced by organizations. Whichever type of uncertainty causes problems, it needs to be managed across all the supply chain participants. It is not enough to confront uncertainty generated by the activities within a single firm. (Geary et al. 2002, 55.) Underestimating uncertainty and its impact can lead to planning decisions that do not guard the company against threats (Gupta & Maranas 2003, 1220).

2.2.2 Nervousness in planning

The fluctuations in planning quality are caused by varying planning processes or a complete lack of planning processes, delays in information flow, long planning horizons or multiple decision making phases in the supply chain. This phenomenon is described by Kaipia et al. (2006, 110) as *planning nervousness*. There are several decision making points and planning phases that increase distortion and fluctuation experienced by the members in a supply chain network. Also, when too many information sources are be-

ing used simultaneously, it may confuse the decision maker (Kaipia 2009, 157). Frequent plan updates according to demand changes and frequent adjustments of forecasts can lead to tremendous changes in plans which may cause planning nervousness as well (Stadtler 2005, 582 ; Kaipia 2007, 3). In order to avoid these frequent adjustments, great emphasis has to be put on choosing the correct forecasting methods (Stadtler 2005, 582). Without an appropriate forecasting method that creates accurate demand forecasts organizations are facing serious difficulties with fighting planning nervousness and reacting to the competition (Crum & Palmatier 2003, 2).

Blackburn, Kropp and Millen (1986, 413–414) approach the issue of nervousness from production's point of view. They state that a change in order size or timing at one level in the production process may result in changes at other levels, which may create nervousness. Uncertainty in the fulfillment of orders, such as unexpected variations in the quantity produced, can make rescheduling necessary and is, therefore, a source of nervousness. The author has noticed that in the case company, requests to change order sizes or product configurations are often received very near the actual order fulfillment date. At some occasions, customers might ask for changes when the product is already finished. Therefore, customers' request to change their order is not always possible. But when changes to orders can be done, production needs to adjust their plans accordingly.

When approaching planning nervousness from a supplier's point of view, there are two issues that might cause extra planning nervousness according to Kaipia et al. (2006, 107–108). First issue is a change of production batches from one mill to another. This may happen with products that can be manufactured at several different mills and the changes can be done very near to the actual demand date. These mill changes aim for the optimization of production capacity use, but nevertheless, they create many problems in the network. The second cause for additional nervousness is that the way how demand communication often occurs in the vendor managed inventory (VMI) model may create fluctuation by suppliers. This occurs because suppliers receive an updated demand forecast weekly or even more often and each time the forecast is sent to the supplier, the minimum and maximum target inventory levels are updated. This causes the target inventory level to change weekly or more frequently. Therefore, this specific method of communicating the demand level creates nervousness and fluctuation to supplier's operations. However, the actual purpose of VMI is to reduce one of the steps causing fluctuations in supply chains. By using VMI, the customer allows the supplier to observe for instance inventory level or sales, and then base replenishment decisions on the observation. This way the supplier is able to decide on the timing as well as the delivery sizes when replenishing the customer's inventory. (Kaipia et al. 2006, 109.) To conclude, VMI may work efficiently and benefit the whole supply chain. Special attention needs to be given to the way how demand is communicated between the customer and supplier in order to avoid unnecessary nervousness by the supplier.

Planning nervousness, and uncertainty as well, are major causes for the bullwhip effect, or whiplash effect as some call it (Kaipia et al. 2006, 99, 110). From several researchers, Lee, Padmanabhan and Whang (1997) describe this phenomenon as exaggerated order swings and amplification of order variances when moving up the supply chain. In brief, it is the distortion of demand information that increases when moving upstream. It creates demand distortion and variance amplification with the consequence of serious cost implications. By sharing downstream demand information more collaboratively and dampening planning nervousness, the causes for the bullwhip effect may be reduced, and vice versa (Kaipia et al. 2006, 99).

2.3 Success factors

Despite the confusion concerning the DM process, most organizations identify its importance and cost reducing impact. However, they also know that in reality it is hard work to achieve the values of the process. That is why DM strategies often falter or fail altogether. In order to develop and implement DM strategies successfully, organizations need to be committed to devote time, effort and personal capital. (Moreira 2009, 12.) Crum and Palmatier (2003, 3, 17, 23) agree that personal investment and human qualities are essential to effective DM. The true competency in the process comes from human judgment and integrated business processes operated by skillful people; not solely from information technology. Successful DM requires the leadership and involvement of sales, marketing and product management organizations. An investment in a forecasting tool that ideally integrates with the organization's planning systems may be considered as a requirement for an efficient DM process. However, statistical forecasting software alone does not yield an accurate forecast. Significant change is often needed: organizations have to rethink their traditional structures and ways of communication, and people must act in new ways. For the process to be truly effective, it must become a deeply embedded part of the culture so it becomes self-sustaining and automatic in time. (Moreira 2009.) The real opportunities of the DM process arise when management realizes to integrate this process with the processes of customers and key suppliers (Croxton et al. 2002, 64). Optimizing the DM processes can unlock the supply chain's whole potential to help win rather than only support customer demand (Lapide 2007b, 7).

The study by Croxton et al. (2002) presents an in-depth explanation of the activities and success factors involved in efficient DM. According to the researchers, the process focuses on predicting customer demand and determining how that demand can be synchronized with the capabilities of the supply chain. Through this framework they advise companies how to implement the process and how to manage it properly, even across firms in the supply chain. This framework is based on the assumption that DM is one of

the eight SCM processes. The starting point is the division of DM into strategic and operational elements. A process team that comprises of managers from different functions, including marketing, production, finance, purchasing and logistics, is in charge of both the strategic and operational processes. People outside the firm, such as customers or key suppliers, may also be included in the team. (Croxton et al. 2002, 51, 53; Lambert 2004, 22.) The aim of *the strategic sub-processes* is to design an efficient operational system for matching supply and demand (Croxton et al. 2002, 53). The strategic element consists of six sub-processes (see below Figure 3).

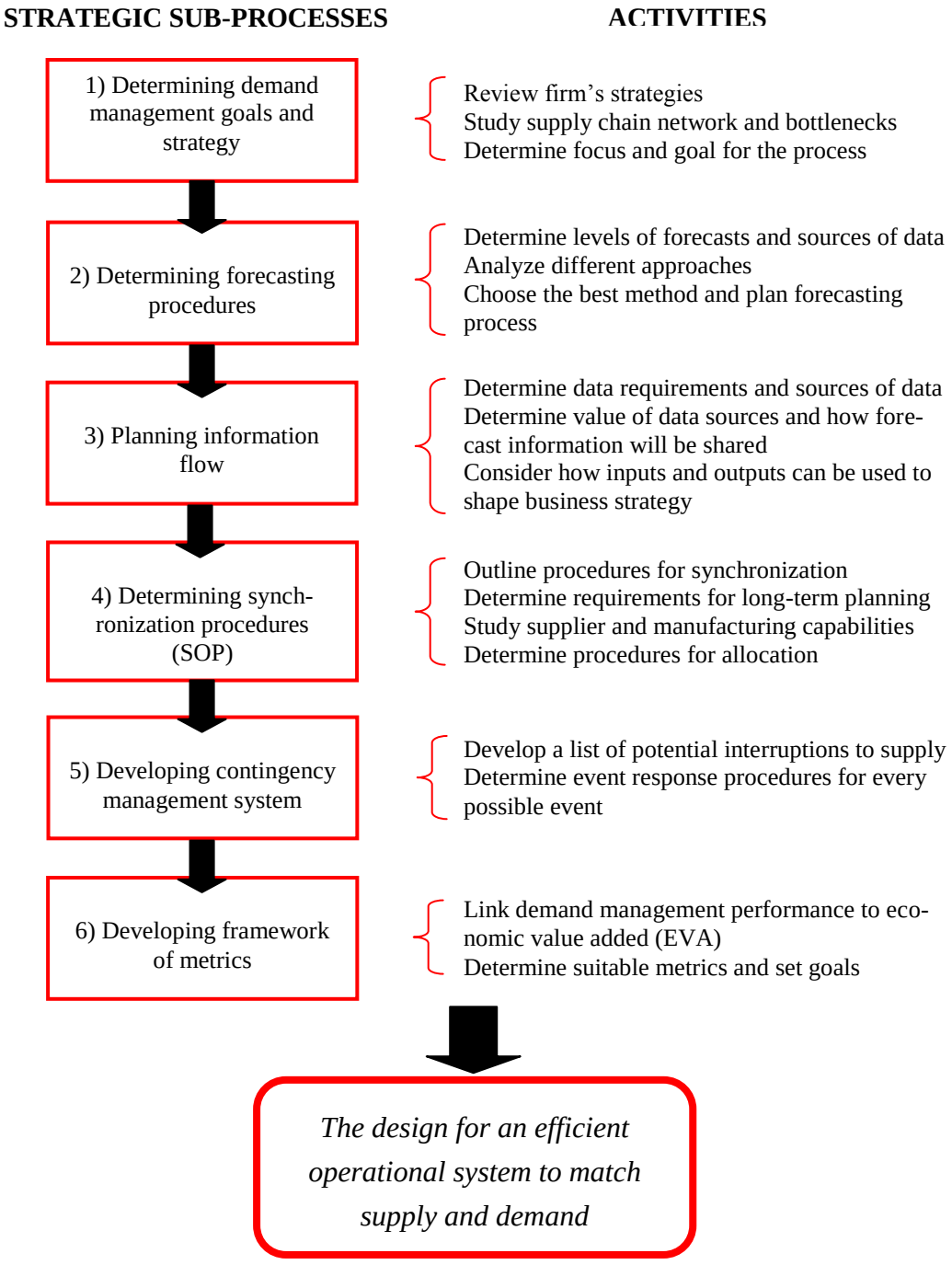

Figure 3 The strategic element of DM (adapted from Croxton et al. 2002, 54)

The first strategic sub-process is focused on *determining the goals and strategy for DM*. In order for this to succeed, the process team must have a wide understanding of the firm's strategy, the supply chain network and its bottlenecks, the manufacturing capabilities, and most of all the customers and their needs. In the second sub-process the team develops one critical piece of DM as well as of demand planning: *the procedures for forecasting*. Decisions concerning time frames and levels of the forecasts needed, the sources of data used and the forecasting procedures for each required forecast need to be made. It is important that these strategic decisions concerning the number of forecasts are made collectively by a team of managers as there often are several forecasts used in the organization. The sources of data for forecasting may include for instance historical data, sales projections or market research. Next, the team analyzes the different approaches and methods for forecasting. The appropriate method depends on the environment where the forecasting takes place. When making this decision, it is important for the team to understand the nature of the demand. (Croxton et al. 2002, 54–56.) Langabeer (2000, 66) emphasizes the same issue in his study, stating that understanding market demand is a central factor in business success. The team also needs to determine the time frames for the reevaluation of the forecasting procedures. That is, how often the team needs to check the forecasting processes and possibly make adjustments. (Croxton et al. 2002, 56.)

The third sub-process is concerned with *planning the information flow*. The team determines sources of data, how the transfer of information will be organized and what output needs to be communicated to whom internally. In addition to internal information sharing, the company needs to decide what data is important to share with other members in the supply chain. (Croxton et al. 2002, 56–57.) Similarly, Kaipia (2009, 149) states that a major issue is to decide what data should be transferred to which members in the chain and what may be ignored. Enterprise resource planning (ERP) systems within a firm may provide consistent information that can be used throughout the organization. However, as stated, the DM process often needs information to flow between firms in the supply chain, not merely within one firm. Integrating systems between firms often requires substantial effort. For example, information systems may be implemented to provide inventory visibility in the supply chain or manage the information flow of a VMI. Nonetheless, certain alternatives such as Internet based applications do not require integration of information systems between the members in the supply chain. These sorts of applications provide an effective means for information sharing with suppliers and customers as well. The team needs to also discuss about ways in which the inputs and outputs of DM can be used to shape future business strategy. (Croxton et al. 2002, 57.) Langabeer (2002, 68) argues that the same information used in the DM process may guide the company’s strategy. For example, analyzing demand and forecast data allows management to create a framework for classifying a

product's maturity. This will assist in determining when to introduce new products and when to phase out existing ones.

In the following, fourth sub-process of the strategic element, the team *develops the synchronization procedures* needed to match the demand forecast with the supply chain's capabilities. This is the phase within DM that is referred to as the SOP process. Demand planning is often considered to be the starting step in SOP. The synchronization requires coordination with marketing, manufacturing, sourcing, finance and logistics departments. As an output, the company will receive a single execution plan that will even out the costs and needs of manufacturing, sales, logistics and the suppliers to meet forecasted demand. This demand execution plan provides the basis for a detailed manufacturing and sourcing plan. It includes aggregate, or product family, production plans and inventory-positioning plans, which need to be communicated not only internally in the organization but to key members in the supply chain as well. (Croxton et al. 2002, 57, 61–62.) Aggregate plans mean plans that group several products with similar demand requirements and common processing requirements (Krajewski et al. 2009, 485). The synchronization process is illustrated in the below Figure 4. This demand execution plan is not synonymous with the term demand plan that is being discussed in this thesis. Namely, the demand plan is the result of demand side operations and is unconstrained by supply capabilities. That is, the demand plan is built from demand forecast and other inputs of demand data.

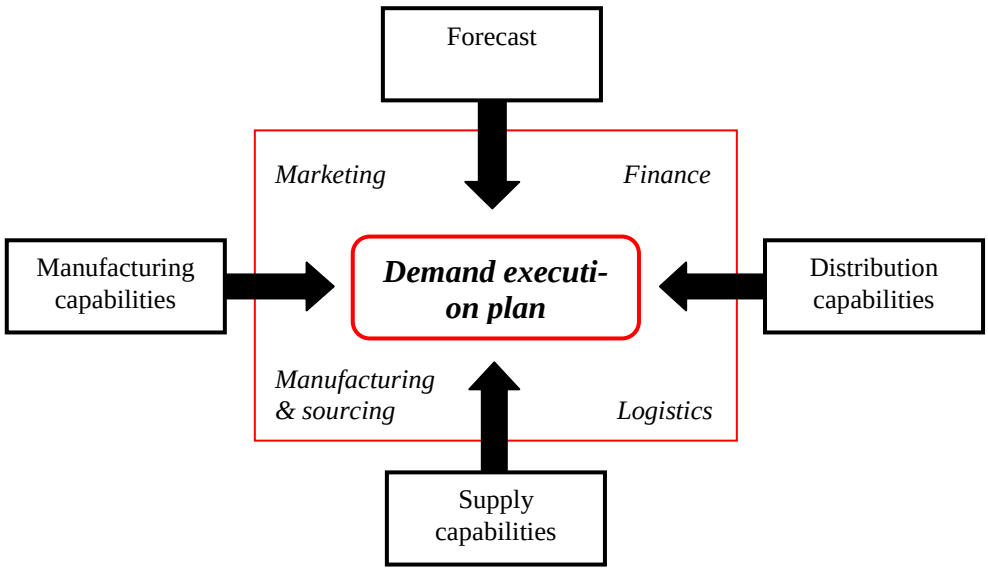

Figure 4 Synchronizing the supply chain (Croxton et al. 2002, 58)

The key purpose of the process team in the synchronization sub-process is to create a complete understanding of the capacity and flexibility of the supply chain. They also need to decide who will be included in the process and determine requirements for long-

term planning. Management should consider integrating main suppliers and customers directly into the synchronization process. The synchronizing procedures partly include also decisions about safety stocks and allocation. However, the created decisions will be rather generic guidelines than final decisions. Due to the fact that the focus of DM changes for each classification of products, it is important to realize that different synchronization procedures may be used for different product lines. For example, new products have the most uncertain demand; therefore the focus is on attaining the most flexibility as possible. The fifth sub-process is concerned with *developing contingency plans*. These are plans that assist an organization as operational interruptions occur. For instance, if a factory is unexpectedly shut down, the firm needs to find new alternative ways on how to proceed. It is at times like these when contingency plans are needed for coping with such sudden events. And when the reaction procedures are determined before the possible event occurs, management can respond more quickly to the unexpected event. (Croxton et al. 2002, 58–59.)

The final sub-process of the strategic DM process is about *developing a framework of metrics* (Croxton et al. 2002, 59). Krajewski et al. (2009, 146) define metrics simply as performance measures that are established for a process. The metrics are used to measure and monitor the performance of the DM process. Naturally, also targets for performance improvement and for motivating the desired behavior are set. (Croxton et al. 2002, 59; Lambert & Pohlen 2001, 10.) However, the development of such supply chain metrics is challenging. One reason for this is the complexity associated with overlapping supply chains. In any case, the lack of a good framework of metrics will most likely result in failure to meet the customers' expectations, conflict within the supply chain and impaired competitive position. The performance of DM is directly linked to firm's financial performance that may be measured, for example, with the economic value added (EVA). EVA is formed of elements such as sales, cost of goods sold, inventory investment, and fixed and other current assets. DM, therefore, has an impact on these elements. (Lambert & Pohlen 2001, 1, 10.) Once the process team has created an understanding of how DM can impact the financial performance, the metrics for the performed activities need to be developed. Very typical measures for DM are, for instance, forecast error and capacity utilization. Whatever activities the firm may take to improve their DM process, they should create the appropriate measurements that monitor the progress of these activities. (Croxton et al. 2002, 60.)

The operational DM sub-processes are concerned more with day-to-day –activities and actualization of DM. At the operational level the team continues the work that was designed at the strategic level. In brief, the team is responsible for executing the forecasting and synchronization. (Croxton et al. 2002 53, 60.) The operational element consists of five sub-processes, which are illustrated in the Figure 5.

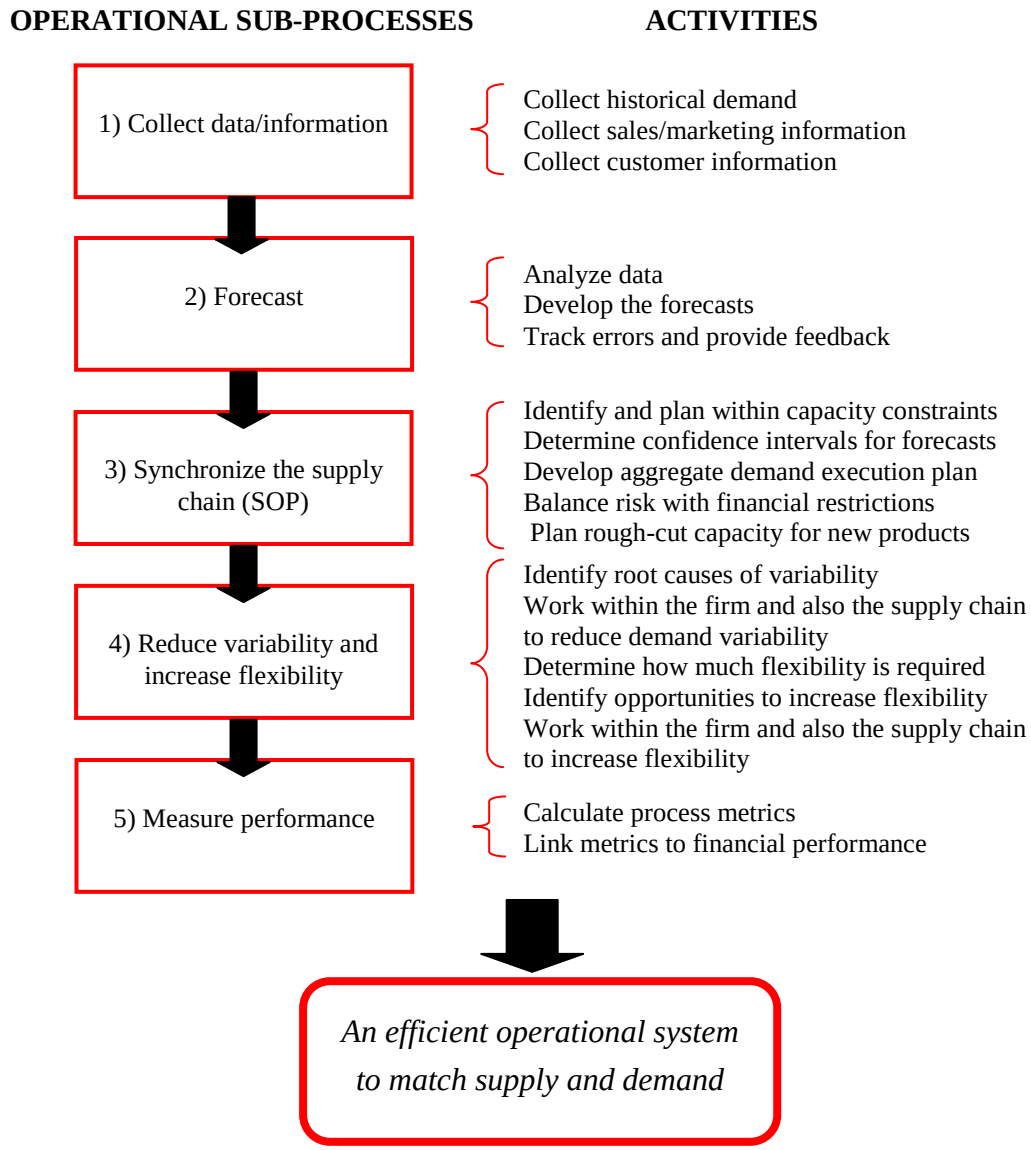

Figure 5 The operational element of DM (adapted from Croxton et al. 2002, 61)

The first sub-process at the operational level consists of *the collection of information*. This includes information about customers, historical demand and sales. At the strategic level the data requirements for creating the forecast were defined and the information systems to help this information collection were put in place. In order to collect the necessary data, the process team must interface with, for instance, marketing department. Interfaces with other SCM processes, such as the order fulfillment, product development and customer service management processes, are also required for receiving the relevant information. Information from the returns management process is used for generating the forecast because it provides information that can help in understanding the actual demand. Namely, the created forecast will be based on inflated numbers if the forecaster measures past demand only by using sales figures. As all the required data is collected, the team analyzes the information carefully and *develops the forecasts* in the

second sub-process (Croxton et al. 2002, 60–61). In this phase, the team needs to take into account previous forecasting mistakes and try to minimize errors by selecting appropriate forecasting models. Eliminating all forms of errors is nonetheless impossible. (Krajewski et al. 2009, 497.) Demand forecasting is discussed more widely in Chapter 3.3.

The third sub-process is about *synchronizing*, or SOP. This is the phase where the team turns the forecast into the demand execution plan. As Figure 4 on page 31 illustrates, the created forecast is only one input in matching demand with supply. Careful consideration has to be also given to capacity constraints throughout the supply chain as well as financial limitations. The team needs to look both upstream and downstream the supply chain if it wishes to understand the capacity limitations. In an ideal situation, the team would know the capacity and the current inventory level of key members in the supply chain. And as this information would be compared to the forecast, it would tell the team what the constraints in the system are. Moreover, the forecast itself might introduce a financial constraint. The team may need to practice risk management when turning the forecast into a demand plan. Risk management simply means balancing risk with financial rewards. Therefore, if it comes to a situation where it is not financially feasible to meet all demand, management needs to decide how to allocate resources most effectively. Contingency plans prepared at the strategic level might also be of use if an unexpected event causes a disruption to supply or large forecast errors. In this subprocess the process team also develops a rough-cut capacity plan for new products that will be launched shortly. (Croxton et al. 2002, 58, 61–62.)

The fourth sub-process is concerned with *reducing variability and increasing flexibility*. Problems in planning are often caused by deviations from the norm and managers spend a great amount of time dealing with the difficulties caused by demand variability. After all, demand variability is often considered as one of the most problematic types of uncertainty. Managers may try reducing the variability itself and they can also increase the flexibility to react to the internal and external events. Efficient DM process focuses on doing both these things continuously. One should, however, acknowledge the fact that flexibility should not be used as a quick and easy fix to something that can otherwise be avoided. The process team should look for root causes of variability in the supply chain and implement solutions to reduce it. It is clear that a supply chain contains many sources of variability and some of these simply cannot be eliminated. In such situations flexibility is extremely important for the company. Building flexibility into a system is, however, often expensive. Therefore, the process team should first determine the amount of flexibility needed because it is important that the level of flexibility is consistent with the requirements of the supply chain. Making this determination requires understanding of customers' needs, demand patterns and planning processes. (Croxton et al. 2002, 62–63.) Kaipia (2009, 154) agrees and adds that flexible opera-

tions should be supported by such planning that will capture demand quickly and frequent re-planning rounds can be made. When planning is more stable, execution flexibility needs to be low. After the team understands the amount of flexibility needed, they should look for ways to attain it. The aim is to be able to determine where flexibility can be added into the supply chain. In the fifth and final sub-process the team is responsible for *measuring the performance* of the DM process. This is done with the use of metrics developed at the strategic level. These metrics, or measures, are used internally to help improve the process. (Croxton et al. 2002, 63.) It is vital to have good measures of performance to evaluate a process in order to get fact based knowledge on how to improve it further (Krajewski et al. 2009, 146).

3 DEMAND PLANNING

3.1 Defining demand planning

Planning is described by Stadtler and Kilger (2002, 71) as preparation for future events. It supports decision making by presenting alternatives for future activities and is needed in managing uncertainty in supply chains. Krajewski et al. (2009, 484) report that planning is a process where decisions are made on how to deploy resources so that a company is able to respond in the best possible way to the demand forecasts. Planning answers to the following question: How much of each item do we need to produce for each time period? This question covers the both aspects of product volume and mix planning. Volume planning refers to how much in total will be manufactured and planning for product mix means how much of each product within a product family will be manufactured. This distinction is important as companies may use different techniques for planning their total volume and mixes. (Kaipia & Holmström 2007, 3.)

Along with the DM process, the role of *demand planning* as a key driver of supply chains has been recognized by many researchers. Some researchers have focused directly on demand planning (see e.g. Rego 2011; Hellriegel 2009; Foster 2008; Stitt 2004; Barr 2002) and some have studied a certain topic closely related to it (see e.g. Venkatadria, Srinivasanb, Montreuilc & Saraswat 2006; Chase 1998). Kaipia (2007, 18) is of the opinion that the role of demand planning is to capture information on market demand and inventories, and further combine it with supply capabilities and constraints to develop a plan for future demand. In this thesis demand planning is considered as one part of DM led by the demand side of a company's operations. Its purpose is to collect all possible information on future demand that will assist the company to create an accurate demand plan. Wagner (2002, 123) holds the view that the purpose of demand planning is to improve decisions that have an effect on demand accuracy and safety stock calculation. Stadtler (2005, 580) argues that the step from pure demand forecasting to demand planning is made by adding to the created demand forecasts the exceptional influences that are assumed to happen in the future. Similarly, Chase (1998, 24–25) states that demand planning should be an integrated process in which quantitative methods and qualitative assessment of future sales would be combined.

Demand may be considered as the result of a firm's actions (Crum & Palmatier 2003, 26). The demand from the final customer can be considered as the force that drives the whole supply chain. Each link in the chain operates in reaction to actual or anticipated demand from the end customer. (Helms, Ettkin & Chapman 2000, 393.) Demand processes refer to the processes at the customer interface and are aimed at responding to demand by creating value (Jüttner et al. 2007, 381). There is an interdependent relation-

ship between supply and demand. Namely, organizations cannot manage demand, create future demand or meet the level of desired customer satisfaction unless they understand demand first. Demand defines the supply chain target and the supply side of the company supports, shapes and sustains demand. (Walters 2008, 701.) However, Mentzer and Moon (2004, 38, 40) feel that too many supply chain managers do not quite understand what drives demand. If supply chain managers wish to even try to understand the demand driven business culture, they need to begin by understanding the concept of demand.

Wallace and Stahl (2008, 19, 23) write that demand planning may be the most challenging yet most important element in the SOP process. When demand planning works well the rest of the process has a much better chance of also working efficiently. Hellriegel (2009, 12) explains demand planning to be widely known as a key driver of business performance since it is a means to forecast accuracy. However, several companies fail to reach the desired level in their predictions on future demand. Improving demand planning can be described as a never-ending battle. For continuous improvement, people involved in demand planning should constantly be on the lookout for new approaches for doing things. Similarly, according to LaVoie (2010, 12), demand planning has emerged as a key factor for building market share in a highly competitive environment. In a difficult and dynamic economy, demand planning along with forecasting will require new ways of thinking, new processes and improved technologies to keep supply chains working efficiently. Supply chain professionals are approaching their forecasting and demand planning challenges by varying actions. Some trust in radical change in processes and technologies, while others only see a need to approach traditional forecasting slightly skeptically. (Foster 2008, 1.)

The demand planning process *results in a demand plan* that is the plan regarding the company's future demand expectations. In this thesis, the demand plan is regarded as a plan that does not take supply capabilities into consideration, as the supply plan is a separate issue that follows after the demand plan is created. Although during demand planning, the company's supply capabilities should constantly be kept in mind. Mentzer and Moon (2004, 43) define the demand plan as one of the two critical plans produced by the SOP process. Without trustworthy sales forecasts for future demand, it is impossible for organizations to try and create accurate demand plans. The other critical outcome from SOP is an operational plan. Here the term operational plan is synonymous with the term supply plan and consists of, for instance, manufacturing and procurement plans. Mentzer and Moon (2004, 43) present their understanding of the demand plan within SOP in Figure 6. The figure depicts the inputs from both demand and supply sides, and the two critical outcomes of the whole process: demand and operational plans.

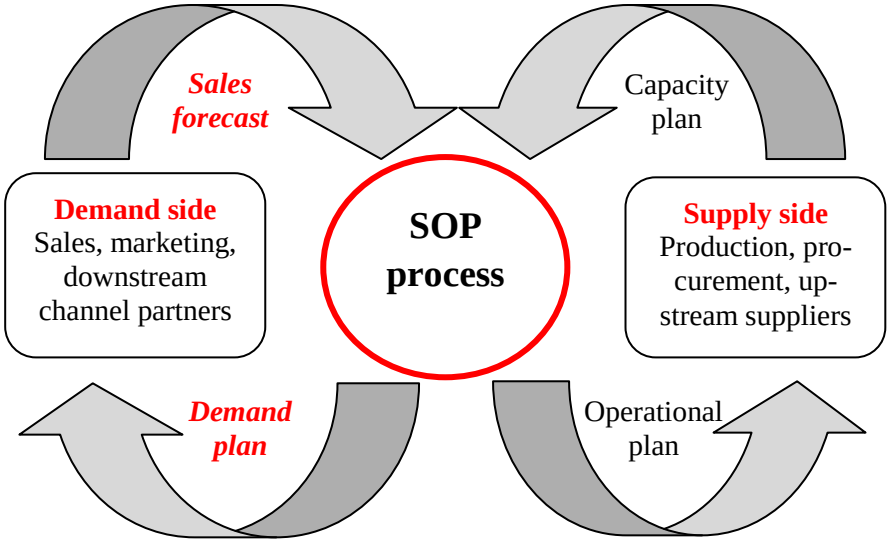

Figure 6 Demand plan as an output from SOP (adapted from Mentzer and Moon 2004, 43)

The sales forecast is the input from the demand side. The capacity plan, the assessment of the future supply capabilities, is produced at the supply side. The demand plan informs the company how to meet customer demand; what products have demand on what market areas. The supply plan then needs to fulfill this demand. Lapide (2006, 18) states that the demand and supply plans are prepared with keeping the corporate goals constantly in mind. Sales, marketing and other demand side functions are involved with executing the demand plans. And, for instance, logistics, manufacturing and procurement departments are the supply chain related organizations involved with executing the supply plans.

As already mentioned in Chapter 2.1.1, Crum and Palmatier (2003, 10–11, 29**)** define the demand plan by presenting a broad view model of DM that results in turning the forecast into a demand plan. The model consists of planning, communicating, influencing, and managing and prioritizing demand. Each element is influenced by the others and as an output of their synchronization, a demand plan is created. Multiple inputs from sales, marketing, the company's strategy and product departments are being used when preparing the demand plan. Also the statistical analysis provides an important input to demand plan in the form of created forecast (see Figure 7 underneath). The demand plan is updated every month rather than every quarter. Therefore, in reality, preparing the demand plan is a re-planning process. This re-planning includes updating the product, marketing and sales plans each month and achieving a mutual understanding on an updated demand plan. Once the demand plan is updated, it is communicated to the supply and financial organizations for synchronization and reconciliation. In fact, the demand plan should be used to drive supply and financial planning. Often and at best, customers and suppliers are collaborating with the company in communicating demand information and develop tactics to capture sales. (Crum & Palmatier 2003, 1, 28.) It

should be noticed that Crum and Palmatier (2003) approach the concept of demand plan similarly as does the author. However, one crucial difference exists. The researchers suggest the demand plan to be the output of entire DM process, while in this thesis the plan is the outcome of demand planning process, not DM.

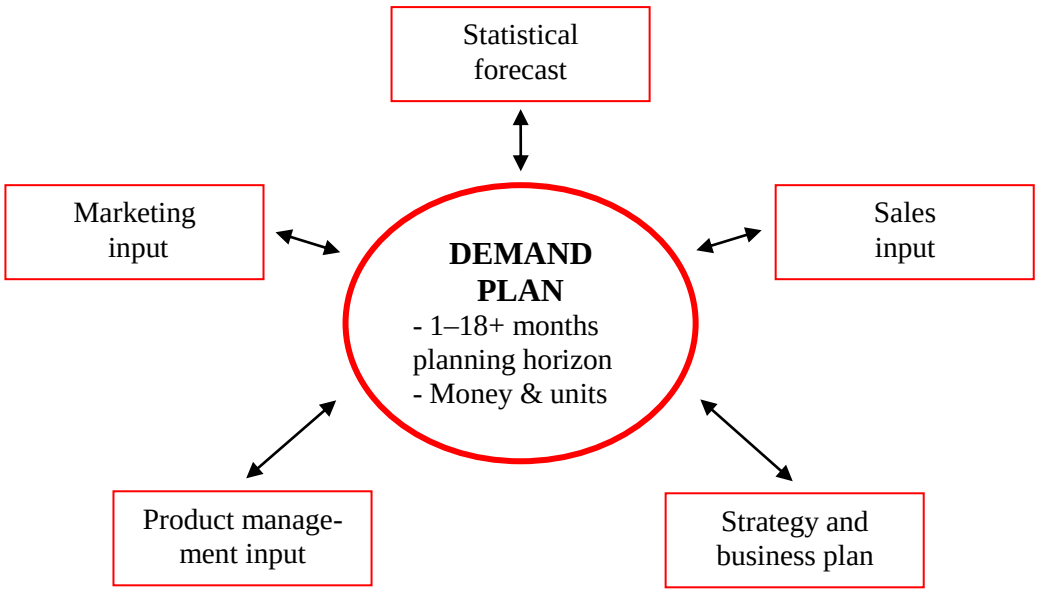

Figure 7 Inputs to demand plan (adapted from Crum & Palmatier 2003, 29)

The statistical forecast provides the historical view, or the backward-looking view, of demand. Often the statistical forecast is adjusted manually. Instead of historical information, these adjustments have a forward demand view as their basis. The freshest forward-looking demand information is received from the demand side of business: sales, marketing, brand and product departments. The forward-looking input from these departments helps to explain the dynamics and complexities of demand as different departments may bring different type of knowledge about demand. (Crum & Palmatier 2003, 33–34.) Below Table 2 gives suggestions what type of information could be received from each department.

Table 2 Inputs to demand plan from forward-looking departments (adapted from Crum & Palmatier 2003, 34)

Department	Required input	Planning horizon
Sales	Customer plans	1–18+ months
	Individual salesperson plans	
	Region sales plans	
	Sales tactics & strategy	
	Promotions' effect on sales	
Marketing	Promotion plans	1–18+ months
	Market plans	
	Monitoring of key economic indicators	
	Competitive analysis	
	Business driver analysis & monitoring	
Product management	New product development	1–18+ months
	Product launch plans (ramp up)	
	Product exit plans (ramp down)	
	Product life cycles	
	Product pricing plans	
	Brand plans	
	Competitors' product tactics	

The benefit from forward-looking departments is clear; they reflect the most up-to-date information about customers, competitors and marketplace. The inputs are based on what is currently being planned to create and manage customer demand. For instance, information concerning the likelihood of expanding business with current customers and probabilities of acquiring business from new customers is vital. That being said, inputs that concentrate on the forward view have also weaknesses. The most dangerous weakness is bias. It comes from a person's mindset that is overly optimistic or pessimistic about the future. A person may have certain blind spots that shield the person from having to face reality. One might, for instance, deny the fact that the sales trend is going swiftly downwards. (Crum & Palmatier 2003, 34–35.) Demand planning can be considered to impact all areas of operations. The more demand driven operations are, the more sensitive and complicated demand planning processes become. (Nielsen et al. 2010, 869.) Hellriegel (2009, 13–14) concludes that demand planning is essentially a

knowledge management process that needs to filter out all unnecessary data and then convert it into useful information. For example, market intelligence comes from different departments within the company as there are several persons holding different types of demand information. Promotional demand information, for instance, is typically acquired from sales representatives and key account activity, on the other hand, comes from key account managers (KAMs).

3.2 Advancing the process

Reeder and Rowell (2001, 3, 6) are of the opinion that the key to success is not the most accurate forecast. Namely, it is how integrated the supply chain is with demand planning activities. Companies and products are not the ones competing against each other; competition occurs between supply chains. This requires an effective combination of people, processes and tools. All three must be in place to produce results. Cook and Garver (2002, 37, 40) explain that seemingly often supply chain practitioners make great strides in forming collaborative partnerships with members in the supply chain, yet the end customer is in too many cases left out of these plans. The researchers propose that supply chains should get closer to the actual end customer and thus form collaborative relationships that center around demand planning. When all participants in the supply chain are involved in planning demand, significant cost reductions in manufacturing as well as logistics may be achieved and therefore also more competitive prices may be offered to customers. When plans are coordinated and shared by all participants in the supply chain, and information is made available across organizational boundaries, each member in the supply chain can gain tremendous benefits. Several companies, however, have failed to realize that coordination in the supply chain is not possible without first understanding demand. (Mentzer & Moon 2004, 45.)

One best practice for demand planning is *the documenting and reviewing of assumptions* upon which the demand plan is based. If a company wishes to improve demand plan accuracy, the made assumptions need to be carefully reviewed, challenged and updated. After all, the numbers in the demand plan are the direct result of the assumptions about demand creation efforts, customers' buying behavior, the economy and other business drivers. A second best practice is to understand the demand plan as *unconstrained* from possible supply limitations as it only represents products and services that customers are expected to purchase. The plan should only be constrained by the demand side personnel's ability to generate sales. A third best practice is to realize the demand plan is actually *a request for products and services*. It is what the demand side believes customers will purchase and they are committed to execute the plan accordingly. (Crum & Palmatier 2003, 37–39.) Kaipia and Holmström (2007, 3) agree by explaining that

based on this plan, suppliers can guarantee that they have adequate capacity for fulfilling the expected demand. Quite often there may be pressure to force the demand plan to match with the business plan. However, this is not a correct approach when reality shows that sales revenues will not most likely materialize at the rate presented in the business plan. Thinking of the demand plan as the request for product helps managers resist the urge to make the demand plan match the sales revenues stated in the business plan. The business plan revenue is, after all, only a target. When there is a gap between the demand and business plan, it should, nevertheless, trigger action to narrow the gap. (Crum & Palmatier 2003, 39–40.)

Stitt (2004, 2, 11) emphasizes the importance of synchronizing people from different functions in the process of demand planning. Kaipia et al. (2006, 111) comment that in general, demand supply planning processes will be improved when the demand data is used more efficiently and productively. POS data and channel customers' inventory data both are useful information. The usage of POS data in understanding demand and enhancing the performance of the supply chain is widely agreed upon (see e.g. Gallucci & McCarthy 2009; Kaipia et al. 2006). Increasing visibility of the end-customer demand improves the performance in the demand supply network (Kaipia et al. 2006, 111). Shapiro (2009, 36) agrees by commenting that POS information plays a significant role in the success of a demand planning process. It may be used, for example, as a basis for demand forecasts or to evaluate the effectiveness of specific promotional activities. Another value of POS data is that by forecasting it, one can learn a great deal about the customer's sales, purchasing and supply chain strategies. However, the most simple and probably most widely used approach for applying POS data in the demand planning process is to use POS history as a reference. The company needs to obtain POS history regularly and look for where significant changes have taken place during recent periods. Based on these findings, order forecasts may then be revised. (Gallucci & McCarthy 2009, 12.) Shapiro (2009, 37) agrees by commenting that historical POS information can greatly assist in identifying trends in the business over time. However, it is worth mentioning that utilizing POS data in the technology industry is considered to be difficult since this type of sales data is extremely difficult to obtain.

According to Mentzer and Moon (2004, 42) the problems organizations typically face with demand planning are caused partly due to incompetent people. People that are involved in demand planning have often little or no training in the subject. From the author's point of view, this statement is correct and truthful in the case company's situation. People who are part of planning demand in a company are not often any experts on the subject. Therefore, companies should invest time and effort in training to ensure people are competent to take part in demand planning. In fact, most businesses have invested in a specific role of *a demand planner*, or a forecaster as some say, and a software system for support (Hellriegel 2009, 12). Chase (1998, 23, 25) argues that a de-

mand planner's responsibility is to provide senior management with decision support analysis and change recommendations that result in improved profitability. Moreover, Chase (2009, 46) explains demand planners mostly work in sales, marketing, financial or operations planning departments and are responsible for making necessary adjustments to statistical baseline forecasts. Their responsibility is not merely to present accurate demand forecasts. A demand planner should be able to determine where in the forecasting system inefficiencies occur and based on this, they should provide improvement suggestions. This type of role of the demand planner is more sophisticated and requires a combination of statistical and business expertise. In addition, the demand planner must oversee the preparation of several forecasts from different departments and finally integrate them into one complete reporting format. This way, for instance, participants in SOP may more easily compare the forecasts and discuss about their decisions that led to these forecasted sales figures. (Chase 1998, 23, 25.) Barr (2002, 28–29) concludes that the demand planner is the driver for the entire forecasting process. They face many challenges, such as insufficient data of the industry, lack of forecasting tools and inadequate management support, which make it difficult to generate the final consensus forecasts. In addition, very often the interaction between different operations within the supply chain is either non-existent or inconsistent. The first step demand planners must take before anything else is to define their role and evaluate what needs to be done. After this, they may determine what forecasting process needs to be put into place and who will be involved in the process. With feedback received from different stakeholders, the demand planner is able to continuously evaluate the established demand planning process. (Barr 2002, 28–29.)

Rego (2011) has concluded that a robust demand planning process is the key to success in any business. He proposes ten steps through which demand planning may be advanced and further developed into a sustainable process. These steps are as follows:

1. Promote feedback
2. Build and improve relationships with trading partners
3. Give feedback
4. Centralize promotional information
5. Establish a process for communicating assumptions
6. Manage unknown data
7. Improve visibility of critical inputs
8. Use control charts
9. Do benchmarking
10. Training.

Promoting feedback is crucial. Feedback from trading partners can be considered as the key to the demand planning process's success. However, feedback is often nonexistent because it is not promoted and encouraged enough. For example, once the fore-

casters have prepared the demand forecasts, they normally do not bother to get any feedback on them. Feedback especially from sales personnel should be promoted. *Good relationships* with the company's trading partners may improve the quality of forecasts. Good and clear communication creates opportunities to tackle underlying assumptions and possible problems behind the prepared forecasts. *Giving feedback* is as important as receiving and promoting it. Giving positive feedback is a simple encouragement method and it gives people an incentive to continue performing well. Negative feedback is also useful; it creates an opportunity to learn from mistakes. *Promotion* plays a major role in generating sales. In order to improve demand planning, it is important to know how promotional activities impact future sales. *Establishing a formal process for communicating assumptions* may contribute to a better demand planning process. Further, *unknown information* within a firm should be managed. The information that comes from different departments should be made available to everyone involved in the process. This way each person know what the others are thinking and doing. *The visibility of critical inputs* needs to be improved. This refers to, for instance, critical inputs to forecasts. This sort of information needs to be made available quickly and to all related people. The use of *control charts* refers to such control charts where trend changes may be identified. (Rego 2011, 31–34.) *A trend* refers to a systematic increase or decrease in the average of the series over time (Krajewski et al. 2009, 493). *Benchmarking* to the industry choices is always encouraged. It can be of major advantage when a company's own process can be compared with the processes of others. Lastly, *training* should not be forgotten. With regular training people can become more motivated and build their skills. (Rego 2011, 35.)

Similarly, LaVoie (2010) presents his view of ten best practices to boost demand planning performance. The researcher starts by stating that effective demand planning has an effect on the overall health of the company. Similar to Reeder and Rowell's (2001, 3, 6) opinion, LaVoie (2010) states that demand planning touches every part in a company: people, processes and technology. Crum and Palmatier (2003, 3) as well hold the same view. They comment that demand planning requires competency in three areas: integration of business processes, people development and information infrastructure. The ten best practices according to LaVoie (2010) are listed below:

1. Tighten up objectives
2. One common language
3. Plan from the inside-out
4. Get to know your chief financial officer

People: Aligning cross-functional resources

5. Network your way to the top
6. Use metrics that matter
7. Understand the broader perspective

Process: Combine actions to goals

8. Scrub your data
9. Build a better technology environment
10. Use it or lose it.

Technology: Achieving clarity through information

The first best practice concerning people relates to *the tightening of objectives*. This can be done by choosing one or two primary objectives and focusing all efforts on achieving them. Too broad a list of goals only confuses the demand planning team. The second best practice refers to the fact that different departments *speak the same language*. For instance, marketing, sales and supply chain professionals need to understand one another in order for all of them to be able to work together as one team. The third practice, *planning from the inside-out*, means engaging the company's trading partners in the demand planning process as it may generate mutual benefit. Too often, the need to protect information creates unnecessary barriers. However, profits may increase for all when distributors, manufacturers and retailers share data and best practices openly. As the fourth practice LaVoie (2010) encourages *more cooperation with the chief financial officer (CFO)*. CFO can offer deep expertise in risk management, for example. With CFO's increased involvement, the demand planning team can also gain improved business insight which helps the team to better understand and reduce risk. The fifth best practice, the first one concerning processes, is about *networking*. Collaborating with supply chain partners may create economies of scale. Not only can trading partnerships lower costs, they can also improve flexibility to respond to customer demand. *The use of relevant metrics* follows as number six. In order to make sure metrics are relevant, input from subject matter experts across different departments should be gathered. The seventh best practice relates to *the understanding of the broader perspective*. Too often, demand planning and forecasting are used interchangeably. Therefore, companies who recognize forecasting as merely one part of demand planning benefit from a more holistic view of the process. Number eight in the list, and the first technology related one, emphasizes *the importance of accurate information*. Inaccurate supply chain data is useless as it can create institutional distrust and undermine objectives. The responsibility for accurate information belongs to everyone, not only to the IT-department. The ninth best practice recommends companies to *build better technology environments*. Advanced technology that enables real-time visibility into the supply chain provides major benefits, such as the evaluation of demand data more quickly and true data inte-

gration between supply chain partners. The final best practice means accessible information should be provided to executives as it would enable *swift decisions*. While comprehensive presentations with accurate information have their time and place, simple and easy-access information may lead to efficient decision making. (LaVoie 2010.)

3.3 Demand forecasting as one input

Forecasting future demand has been widely studied through the years, along with numerous different forecasting techniques. Researchers and managers recognize the usefulness of demand forecasting when trying to successfully respond to customers' ever changing demands; companies must try to predict upcoming demand one way or another. In the past, very little attention has been devoted to examining how the process of forecasting should be managed and organized; most studies have concentrated on the proper techniques (Mentzer, Bienstock & Kahn 1999, 48). However, according to the author, this has been starting to change towards a more process oriented conception of forecasting. Demand forecasting is sometimes confused with DM (see Lapide 2006, 19; Crum & Palmatier 2003, 10, 26; Langabeer 2000, 69) as they are often considered to mean the exact same thing. However, it is important to understand that demand forecasting and DM are not synonyms, although forecasting has yet an important role to play in DM. Quite similarly, Mentzer and Moon (2004, 41–42) explain that forecasting is too often equated with planning, which is also an incorrect perception. Operational plans are sets of managerial actions designed to meet the sales forecast. When the level of demand is known, the company can plan on achieving sales at, or near, that level. Every time any kind of plan is being developed, a forecast should be made before it to support the plan. A plan cannot drive the forecast; the forecast needs to be the driver for the plan. Further, sales targets need to be distinguished from the terms sales forecast and operational plans, as the targets are only goals that provide motivation for the personnel. Likewise, Crum and Palmatier (2003, 26) emphasize that forecasting is only a part of planning demand. Chase (1998, 23) on the other hand, comments that a sales forecast is nothing more than a by-product of a good demand plan. It is created through combining statistical analysis with a strong business understanding.

Mentzer and Moon (2004, 42) explain that the aim of demand, or sales, forecasting is to know what customer demand is by using both qualitative and quantitative techniques. Lapide (2006, 19) concludes the result of demand forecasting is a quantitative evaluation of long-term revenues generated by each customer segment. Without sufficiently accurate forecasts, it is extremely difficult to match production with demand (Quinn 1998). Additionally, a major benefit from improved forecasting is that it can substantially reduce the inventories for raw materials and finished goods (Croxton et al. 2002, 51).

Forecasting is often the most maligned department in organizations (Helms et al. 2000, 393). The forecast is very often a subject of much distrust and debate. Preparing of the demand forecast is often seen as a single event rather than as a part of a wider process. When forecasting is treated this way, its accuracy inevitably suffers. As a conclusion, the trust in the forecast fades as it is regarded to be wrong every time. (Crum & Palmatier 2003, 9.) Quite a few companies know that their forecasts are inexact, but do not know how to advance their forecasting process and therefore end up ignoring the issue altogether. This forces companies to find ways to prepare themselves for the uncertainty caused by inaccurate forecasts. Building excess inventory is the most often used method in such situations. (Helms et al. 2000, 393–394.)

Chase (2009, 1–2) argues that over the years, demand forecasting practices have been changing to the direction of shaping and proactively driving demand, rather than reacting to it. The researcher brings forth a concept named demand driven forecasting. It consists of sensing demand signals, proactively shaping demand and responding to demand. Demand forecasting is now ready to take a central role in driving real value within supply chain since data storage and processing have been improving greatly over the past several years. (Chase 2009, 1–2, 24.) Foster (2008, 2–3) explains that there are numerous software tools and solutions that can provide the needed demand information for the creation of a forecast. However, *the forecasting process* itself contains much more than learning about new forecasting models and software tools. Foster concludes that organizations should put more emphasis on the process itself, not merely on the tools that create forecasts. Similarly, for example, Mentzer and Moon (2004, 43), Langabeer and Stoughton (2001, 7), and Mentzer et al. (1999) emphasize the importance of the whole process. Organizations need to have a well-established and iterative process of demand forecasting and planning. At best, it should involve representatives, for instance, from sales, marketing, finance, production and logistics departments. (Mentzer & Moon 2004, 43.) Foster (2008, 3) explains further that SOP has been used for several years as the planning coordination process of many departments within a firm. Without SOP, each department would use their own forecasts and make decisions without communicating with other departments.

According to Lapide (2009, 18–19), forecasting is all about understanding demand variation and forecasting it. After all, if demand would not vary at all, there would be no need to forecast. During these turbulent economic times, forecasters are facing more demand variation caused by promotional events and economic conditions than during normal economic times. Such variation creates challenges for forecasters. They are hard to forecast because promotional effects on demand are not well understood and because historical data does not help sufficiently in estimating the impact of an economy that no one has ever seen before. In order to try mitigating the effects of such variations, forecasters should, for instance, know what is happening in the market by communicating

more with marketing department. They should also collect downstream data as early indicators of the performance of promotions and communicate forecast errors to the whole organization. Krajewski et al. (2009, 484–486) as well as Chase (2009, 57) state that most forecasting methods fall into two categories. *Quantitative methods*, referring to mathematical models that use historical data as input and *qualitative*, or *judgment methods*, that draw on the experience and judgments of managers. Forecasting can, however, be based on both these methods. The quantitative methods include causal methods and time series analysis. *Causal methods* predict demand by using historical information on independent variables such as economic conditions. (Krajewski et al. 2009, 484, 486.) Chase (2009, 59) explains that the basic idea in causal methods is that future sales of a certain product is closely associated with a change in some other variable, such as a change in price. *Time series analysis*, on the other hand, relies heavily on historical demand information. By using time series method, trends and seasonal patterns may be detected. Time series can be defined as the pattern that is formed of repeated observations of demand for a product or service in their order of occurrence. For example, trend or seasonal patterns are considered as demand time series. (Krajewski et al. 2009, 484, 486.) Time series analysis is probably the most frequently used statistical forecasting method (Crum & Palmatier 2003, 28). However, one of their major disadvantages is that such methods adjust slowly to changes in sales (Chase 2009, 59). Estimates from a company's sales men and market research are examples of most widely used judgment methods. Such techniques are often used to modify forecasts prepared by quantitative methods. (Krajewski et al. 2009, 485–486.) Chase (2009) is strongly of the opinion that most accurate demand forecasts may be gained by using statistical analysis of demand data. He argues that too many organizations are quick to dismiss any statistical demand forecasting approaches. This is unfortunate, since basing forecasting decisions only on judgment and gut feeling is not the way to accurate forecasts. (Chase 2009, 7.)

It is a common opinion among researchers that especially during such ever changing economic times, relying merely on historical demand information may not be the best way to predict future demand (see e.g. Lapide 2009; Gung, Leung, Lin & Tsai 2002; Helms et al. 2000, 394; Langabeer 2000, 70). It is dangerous to assume that history will keep repeating itself and that customers will continue with the same buying behavior. Only in an environment where demand is stable and few changes are to be expected, a forecast based on history may be the most accurate input into demand planning. (Crum & Palmatier 2003, 31–32.) However, a more strategic approach would be to use all available market data and intelligence for demand analyses (Langabeer 2000, 70). The concept of *collaborative forecasting* is described by Helms et al. (2000) in much the same way in which the entire demand planning process is represented. It is a way in which the entire supply chain is participating in decision making about the demand.

Helms et al. (2000, 404–405) state that in the collaborative forecasting process companies attempt to supplement the traditional, historical based forecasting approach with information gathered from customers, the marketplace, sales and other important departments. The forecasting process's role includes for the most part coordinating and managing received information so that the supply chain knows exactly what and when to manufacture, and where the products will be delivered. This evolution of forecasting may be called *"zero forecasting"*, as forecasting in its traditional meaning no longer yields the best results for organizations. Helms et al. (2000, 405) even predict that, eventually, forecasting may evolve to the point where actual forecasting is not even necessary. Demand information will be supplied by supply chain partners completely and in detail, and therefore the need for predicting demand will be eliminated.

In collaborative forecasting, issues of complexity are overcome by information sharing. For example, sales department brings fresh information from customers, marketing informs about the latest market trends, production brings their expertise about manufacturing capacity, and purchasing contributes with information from the suppliers. All these pieces of information and the statistical analysis based on historical data are then brought together to form a single and improved demand forecast. Although historical information remains a vital piece in the demand forecasting process, one major benefit of collaborative forecasting is that it reduces the reliance on such information. And when preparing the statistical forecast, statistical tools are invaluable in creating this baseline forecast and should be used if available. There is no single right method for collaborative forecasting, that would apply for all organizations. However, there are some key elements that companies need to take into notice when considering a collaborative forecasting method. The forecasting process normally begins with the critical step of deciding who or what department will be responsible for the forecasting process. The next step is to form the forecast collaboration group. Its members should represent a variety of functional areas, such as sales, marketing, production, finance and perhaps also suppliers and customers. As a group, they need to decide on the goals and needs of the forecasting process, as well as identify the relevant sources of available information. The following step is to decide on the process by which the various pieces of information are brought together. Often, companies choose a review meeting process where at least two meetings per month are being held. Incentives and measurement need to be a part of the process. Otherwise, the process will end up as nothing more than good intentions. Measurements may vary, but they should at least include the measurement of the actual sales versus the forecast. (Helms et al. 2000, 393, 395–402.)

Further, a study by Mentzer et al. (1999) presents four dimensions in effective sales forecasting management. These include functional integration, approach, systems and performance measurement. Improvements made in these four dimensions further upgrade the stage of the forecasting process. *Functional integration* consists of efficient

communication, coordination and collaboration between different departments. Improvements in functional integration that would lead to more efficient forecasting should start by recognizing forecasting as a functional area that aims for mutual conception between different departments. The dimension of *approach* encompasses how forecasting is being approached and executed within a company. Improvements in the approach require companies for instance obtain top management support for the forecasting process, train forecasting personnel in forecasting analysis, and possibly segment customer base in order to forecast key customers separately. The *system* dimension refers to the specific software used in forecasting. Companies seeking to improve the effectiveness of their forecasting systems should create a system that allows all departments involved or affected by the forecast to have access to the process. Key customers and suppliers should also be attempted to enfold into the forecasting information system. The final dimension in effective sales forecasting management is *performance measurement.* It includes the metrics and gathered information used to determine the effectiveness and accuracy of forecasting. (Mentzer et al. 1999, 49–51, 53–55.) Croxton et al. (2002, 61) as well argue that it is important that organizations measure and analyze forecast errors, and use this information to fine-tune the current forecasting methods. Lapide (2007a) gives two main reasons why forecast errors should be measured: to learn from them and to manage demand risk. Learning from mistakes is probably the most important reason for measuring forecast errors. The errors should also be analyzed and communicated more widely in order to find the areas that need the most improvement. Nevertheless, most forecasters do not want to bring up the topic of forecast errors because they are afraid they will be to blame for them (Lapide 2007a; Mentzer & Moon 2004, 45). However, risk management strategies need these estimates of forecast error to mitigate demand risk. Inventory buffers are an example of one risk management strategy. Holding a safety stock inventory of finished products is a relatively common inventory management strategy for reducing demand risk. Also another manufacturing buffer strategy involves operating plants at somewhat less than full capacity. This ensures having excess capacity available when demand rises above to what was planned. (Lapide 2007a, 17–18.)

To improve forecasting performance measurement, companies should make sure forecast accuracy is measured at all levels relevant to the departments using the forecast. It is also important to use a measure that is relatively simple and with which management is comfortable. (Mentzer et al. 1999, 55.) For instance, *mean absolute percent error (MAPE)* relates the forecast error to the demand level in a specific time period. (Krajewski et al. 2009, 498.) Chase (2009, 86–87) argues that MAPE is the most commonly used accuracy measure. Since it gives out a percentage, the measure is a relative one and easily understood. Therefore, it is considered to be useful in communication purposes and when making comparisons among forecasts from different scenarios.

MAPE can be calculated by first calculating the absolute value of forecast error in a specific time period divided by the actual demand in that period. This is repeated with each time period. The results are then added up and the sum is divided by the total number of periods used in the calculation. The final result is multiplied by hundred which gives a percentage value of how much the forecast has deviated. (Krajewski et al. 2009, 498.)

3.4 Demand planning processes in make-to-stock and make-to-order environments

Manufacturing companies differ in the way they plan to meet demand. Some use the method of delivering products to customers from finished goods inventories and others manufacture only in response to orders. (Nielsen et al. 2010, 869.) In the case company, both strategies are being used. A company using *MTS strategy* carries an inventory as customer orders are filled from stock. Therefore, required delivery speed and reliability is high. Manufactured products have relatively standard product characteristics and product variability is narrow. Uncertainty experienced in MTS companies often relates to demand variability. However, the inventory offers a source of flexibility against these fluctuations in demand. As a conclusion, the main challenge is to hold the right sized inventory to meet forecasted demand. Further, if the inventory is considered as the source of flexibility, forecasts have a crucial role and forecast accuracy needs also to be measured. (Kaipia 2008, 125–126.)

MTO strategy is being used when companies build products to meet customer specifications when there is demand for them. MTO is normally used when there are several possible configurations and when exact customer requirements are difficult to forecast. Therefore, MTO is a suitable strategy for a company manufacturing customized products and have a large product variety. Product lead times may be long but they are always agreed with the customer. (Kaipia 2008, 126; Hendry & Kingsman 1989, 1.) The backlog of orders may be long, even months, and it forms a large part of the delivery time. This delivery lead time may be considered as the main source of flexibility in MTO companies. Uncertainty in MTO strategies concerns mainly the product specifications after they have entered the system. For example, in the case company, customers might realize they want changes to already confirmed and configured orders, or they want shorter delivery times. These issues create uncertainty on an every-day basis. The MTO manufacturer's ability to compete depends to a large extent on their ability to allocate resources and materials before the actual orders are received. (Kaipia 2008, 126.) Only in very extreme cases it is unnecessary for MTO companies to use forecasts as a base for demand planning. In other words, forecasting is vital for MTO companies; in-

creased knowledge about customer ordering behavior is extremely useful. (Nielsen et al. 2010, 869.)

Prior research offers limited amount of information concerning demand planning processes in MTS and MTO environments. One thorough study, however, was found. Namely, Wallace and Stahl (2008) explain their view on the demand planning process specifically with these two strategies. According to the researchers, demand planning can be approached in an almost similar manner in both environments. The flow of activities is somewhat similar in them. Nevertheless, a few differences may be identified. The demand planning structures in MTS and MTO environments are presented in the below Table 3. In addition, the few varying actions in these strategies are pointed out.

Table 3 Demand planning characteristics in MTS and MTO environments (adapted from Wallace & Stahl 2008)

MTS and MTO demand planning phases	Phase description	Possible differences
1) Forecast variance review & aggregation	• Review and analyze causes of significant forecast variance • Finalize the statistical forecast	
2) Updating of new product forecasts	• Prepare forecasts for new products	
3) Forecasting of new order volumes	• Obtain demand projections of future business from the market field and add them to the existing forecasts	• Is used more extensively in MTO companies
4) Consideration of external factors, assumption documentation, financial conversion & reconciliation	• Consider external factors and document the made assumptions relating to e.g. the market or expected behavior of certain customers • Finance department participates • One or several reconciliations occur in the overall demand planning process	
	→ when forecasts are prepared in both mixes (measured with SKUs) and volumes (measured with product families)	• MTO companies often lack SKU-level statistical forecasting process
	→ when the differing views within the sales and marketing departments are brought together	• In MTO companies, marketing department does not have a large role in forecasting
5) Executive authorization	• Senior sales and marketing executives approve the prepared forecast	

The first, second and fifth step in the flow of activities within MTS and MTO strategies are described to be similar; no major differences may be identified. The first differing action arises in the third phase, forecasting of new order volumes. Namely, this step

is used more extensively in MTO companies as it is essential that sales managers in MTO environment project future business from their customers as accurately as possible. (Wallace & Stahl 2008, 21.) In the fourth phase, Wallace and Stahl (2008, 22–23) have identified two differences that concern the made reconciliations. One or more reconciliations usually take place. One concerns the mix forecast, which is measured with stock keeping units (SKUs) and the volume forecast, which is in product families. These two forecasts need to be brought together as the sum of the mix must approximate the volume forecast. A SKU is an individual product with an identifying code and it is being held in inventory somewhere along the supply chain (Krajewski et al. 2009, 485–486). Another reconciliation occurs when the differing views within the sales and marketing departments are brought together to form one unanimous understanding (Wallace & Stahl 2008, 22). As a first difference, it can be stated that MTO companies often do not forecast on stock keeping unit (SKU) level. The second difference relates to the fact that in MTO organizations the entire forecasting process is to most part sales department driven; the role of marketing people is not central. Sales people are closely involved with customers and through these contacts they attempt to gain better insight into their future buying plans. (Wallace & Stahl 2008, 23.)

Although the flow of activities is proven to be nearly the same in MTS and MTO environments, one different issue related to the MTO process should be acknowledged. Namely, since in an ideal MTO organization there is no finished goods inventory, the demand planning process, along with entire SOP, needs to focus on the projected backlog of orders to ensure that lead times are competitive and products may be shipped on time. (Wallace & Stahl 2008, 23.)

3.5 The broader context of supply chain planning

Increasing competitive pressures make supply chain planning as one of the key discussion topics among manufacturing organizations. According to one definition, *supply chain planning* is a specific supply chain coordination mechanism that may be described as the coordination and integration of key business activities in an organization, from the procurement of raw materials to the distribution of end products to the customers. In brief, supply chain planning means the activities that focus on evaluating demand for required capacity and material. Effective integration of the often conflicting objectives of various business functions, such as marketing, purchasing and manufacturing, is the primary goal of supply chain planning. (Gupta & Maranas 2003, 1219.) Similarly, Kaipia and Holmström (2007, 3) recognize supply chain planning as the process that captures information on market demand and then combines it with supply capabilities to create a plan for future demand. Supply chain planning processes are greatly challenged

due to the complex structure of supply chains. The requirements of each member in the network, for instance suppliers that supply the company with long lead time components, need to be taken into account. High inventories and distorted demand may be the result of difficulties in combining long planning cycles with the market requirements for speed and flexibility. (Kaipia et al. 2006, 95–96.) Moreover, if managers and executives are not involved and lack confidence in the company's planning capabilities, improvement is difficult (Muzumdar & Fontanella 2006, 36).

Kaipia (2008, 124) gives three reasons why the planning function in supply chains is necessary. First, each company has a limited amount of resources that need to be allocated between different functions, such as production, transportation and stocks. Manufacturing organizations may need to plan how to divide capacity when several products share the same production resources. In the same way, plans need to be made concerning the allocation of products for different customers when demand exceeds supply. Some customers may be of more value to the company; therefore plans about possible customer prioritization need to be made. Secondly, lead times in production or inbound logistics can be relatively long, and therefore customers might not get their needs satisfied immediately. Planning is required to estimate beforehand the lead times. Thirdly, uncertainty is present in all supply chains and planning is needed to manage the different types of uncertainties. Kaipia (2009, 148) continues explaining that previous research shows there to be certain determinants that affect the choice of a supply chain planning approach. The determinants are mostly related to market and product characteristics, such as demand variability, product variety and customization.

The fierce competition in the marketplace forces supply chains to react fast to significant changes. One indicator of the ability to react is *the planning cycle time*; how much time passes from the beginning of the first cycle to the beginning of the other cycle. Long planning cycles are not able to take into account short-term changes in the environment. When the company defines a suitable planning cycle, they need to consider the level of aggregation for a planning process, the planning horizon and the amount of effort that will be put to planning. (Kaipia 2008, 125.) *The planning horizon* is a certain predefined time period. When this horizon is reached, a new plan needs to be made that reflects the present state of the supply chain. (Fleischmann et al. 2002, 71.) As already mentioned in Chapter 2.1.1, planning processes may be categorized according to the planning horizon as long-term, medium-term and short-term planning processes. These can be also named as strategic, tactical and operational levels of planning. Several planning models for each different planning horizon are available for organizations. (Gupta & Maranas 2003, 1219.) Strategic planning is making resource decisions over the long term. Tactical planning level includes a time horizon of one to two years. Operational planning forms the link between tactical planning and the actual execution of the plan. (Kaipia 2007, 17–18.)

The planning processes in supply chain planning normally include several phases that may be complex and are typically a mixture of automated and manual processes. Only few companies have departments that are devoted to carrying out end-to-end supply chain planning. The lack of integrated planning processes is a serious deficiency which leads to many supply chain inefficiencies. (Kaipia 2007, 20–21; 2008, 123–124.) Uncertainty creates the need to use systematic types of planning and control systems. Such systems help in managing the unpredictability in supply chains. The most commonly used systems are material requirements planning (MRP), manufacturing resource planning (MRPII) and enterprise resource planning (ERP). (Koh & Tan 2006, 474.) *MRP* is a computerized information system developed to help manufacturers manage dependent demand inventory replenishment orders. *MRPII*, on the other hand, is defined as a system that binds the basic MRP system to a firm's financial system and to other core processes. *ERP* systems, such as SAP, are described as large, integrated information systems that support several processes within a company. (Krajewski et al. 2009, 562, 564, 579.) MRP is the most traditional planning concept and it is implemented in nearly all ERP systems (Fleischmann et al. 2002, 74). These above mentioned planning systems may act as the information core in an organization and can help in identifying and understanding the effects of supply chain uncertainty (Koh & Tan 2006, 474). Further, systems called *advanced planning and scheduling (APS)* are commercial software packages available for organizations that provide tools for advanced planning by using mathematical programming and solution algorithms. For instance, when ERP systems need additional tools in the area of planning, APS systems offer one means for filling this gap. (Stadtler 2005, 575, 578.) However, APS have also weaknesses as they may often be relatively complicated and even too sophisticated. Tenhiälä (2011, 65, 74) concludes that many companies use considerably simpler planning methods than these. It greatly depends on the complexity of the processes in the company; simple planning methods can be most effective in certain production processes and as a result, APS systems may not suit every company’s interests. Stadtler (2005) also agrees that there are many deficiencies in the current APS models.

The supply chain planning matrix (SCP-matrix) is a matrix that classifies supply chain planning tasks according to two dimensions: planning horizon and supply chain function. The planning horizons are classified as short-term, medium-term and long-term horizons, whereas the supply chain functions in the matrix include procurement, production, distribution and sales. Each supply chain function includes tasks in each of the three planning horizons, thus forming a matrix. (Fleischmann et al. 2002, 76–77.) The SCP-matrix may also be used as a tool to help position the software modules of, for instance, most APS system vendors, as a general structure underlying in most APS systems can be recognized (Stadtler 2005, 579). The SCP-matrix following the form of planning software modules is illustrated in Figure 8.

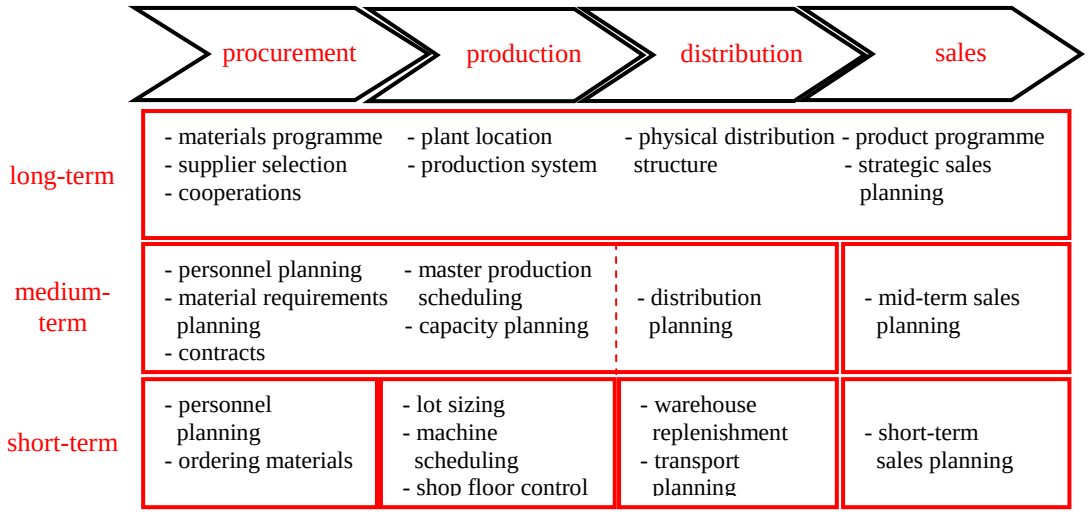

Figure 8 The supply chain planning matrix (adapted from Fleischmann et al. 2002, 77; Meyr, Wagner & Rohde 2002, 99)

All *long-term supply chain functions* refer to strategic network planning. Basically, the aim of strategic planning tasks is to design the supply chain and the material flows between customers and suppliers. (Meyr et al. 2002, 100.) The planning interval may be up to seven years when making plans in the strategic network planning section. Here, for instance, the location of plants, warehouses and geographical customer areas to serve are laid out. (Stadtler 2005, 580.) *Medium-term procurement, production and distribution functions* are coordinated by master planning. The purpose of such planning tasks is to synchronize the material flow along the whole supply chain by trying to find out the most efficient way to fulfill demand forecasts over a medium-term planning horizon. (Stadtler 2005, 580; Rohde & Wagner 2002, 143.) The results from these planning tasks are instructions, or targets, for production planning and scheduling, transport planning, and purchasing and materials requirement planning (Rohde & Wagner 2002, 143). At certain rare occasions, as an addition to master planning, a separate distribution planning software for a more detailed execution of the medium-term distribution planning function is offered (Meyr et al. 2002, 100).

Medium-term sales planning function is referred to as demand planning. It consists of mainly medium-term sales planning tasks but also some further tasks of strategic sales planning. (Meyr et al. 2002, 100.) The purpose of such planning is to create a reliable demand plan. This means improving decisions that affect the demand accuracy and the estimation of safety stocks to reach a predefined service level. (Wagner 2002, 123.) *The planning tasks of short-term procurement* are called as purchasing and MRP. However, only rarely APS providers offer this software module directly because these planning tasks are often left to ERP systems. ERP systems are needed as transaction systems in any case and they traditionally execute these planning tasks. (Meyr et al. 2002, 100–101.) The software module of production planning and scheduling cover the *short-term production tasks*. This planning section aims at creating detailed production schedules

for a short-term time horizon. (Stadtler 2002, 177.) Decisions concerning production shifts, machine groups or flow lines that may become a bottleneck in the production line are being made. Possible operations to manage these possible bottlenecks need also to be planned. (Stadtler 2005, 580.) *Short-term distribution planning function* is covered by transport planning (Meyr et al. 2002, 100). Short-term distribution planning means the forming of truckloads for different destinations, based on production orders that need to be completed the next day or the next shift. For this to successfully work, detailed knowledge of upcoming orders from warehouses and customers is required. (Stadtler 2005, 581.) Lastly, *short-term sales planning function* refers to demand fulfillment and available-to-promise (ATP). The purpose is to determine how the actual customer demand is fulfilled. The core of such planning tasks is order promising and the goal is to create in a short time reliable promises for the customer orders. (Kilger & Schneeweiss 2002, 161, 171.)

4 LITERATURE BASED DEMAND PLANNING FRAMEWORK

As many researchers have concluded (see e.g. Mentzer & Moon 2004; Langabeer 2000), the definition of DM is still evolving and it is considered as a complex concept. The author agrees with Lapide (email 23.11.2011; 2007b; 2006) that DM is the concept that covers all supply chain processes aiming to match demand with supply. Nervousness in planning and many types of uncertainties affect how well a company can manage its DM activities. It has become evident that from all the different types of supply chain uncertainties, the product demand creates the most uncertainty. Especially during these turbulent economic times, the environment and economic conditions influence strongly on the degree of demand uncertainty. The growing demand uncertainty is also one of the reasons why so many organizations keep safety stocks and feel the need for more flexibility in their operations. However, flexibility should not be regarded as a quick and easy fix to something that can otherwise be avoided. Therefore, the causes for uncertain demand should first be identified and solutions to reduce them should be implemented. (Croxton et al. 2002, 62–63.)

One of the DM processes, SOP, may be described as a best practice in manufacturing organizations. SOP aims in efficient synchronization of demand and supply plans within a company. The focus of the process is in bringing several departments together in order to create a unanimous understanding about future demand and supply capabilities. Demand planning is one major process within DM and is often also the starting phase in SOP. It can be stated to be mainly the responsibility of the company's sales unit although collaboration between several departments is extremely important. The process can be also connected to other wider concepts than DM, from which supply chain planning is one. For example, regarding demand planning from the SCP-matrix point of view, the process covers the medium-term sales planning tasks. The purpose of demand planning is to collect all necessary information on future demand resulting in the creation of a demand plan; the first step in matching demand with supply. It can be concluded that demand planning processes in MTS and MTO companies follow somewhat the same steps and therefore it is not necessary to discuss them separately in the empirical part of this thesis (see Wallace & Stahl 2008). Several researchers (see e.g. LaVoie 2010; Nielsen et al. 2010, 869; Hellriegel 2009; Wallace & Stahl 2008) have acknowledged demand planning to be a key driver of business performance. At the same time, improving demand planning can be described as a never-ending battle (e.g. Hellriegel 2009, 16).

However, in demand planning research literature, generally acknowledged conceptions about certain factors that contribute to a more efficient demand planning process may be found. To start with, collaboration between the company and its external part-

ners, as well as synchronizing people from different functions within the company are key factors in successful demand planning that are widely agreed upon (see e.g. LaVoie 2010, 12; Mentzer & Moon 2004; Stitt 2004, 2; Crum & Palmatier 2003, 13). Supply chains are the ones competing against each other and in order for them to succeed, the organizations within a supply chain need to be integrated with one another. This requires an effective combination of people, processes and tools (e.g. LaVoie 2010, 12; Reeder and Rowell 2001, 6; cf. Crum & Palmatier 2003, 3). All three must be in place to produce results. Further, when planning demand, it is crucial to separate forecasting from the concept of planning, as in reality forecasting is merely a part of planning demand. Too often demand forecasting is equated with demand planning, which is an incorrect perception. Each time a plan is being created, a forecast should be prepared before it to drive the plan. The step from pure demand forecasting to demand planning is made by adding to the created demand forecasts the exceptional influences that are assumed to happen in the future (Stadtler 2005, 580). The author illustrates in Figure 9 her understanding on required participants that bring their contribution to the process of creating the demand plan and what input they could be expected to bring.

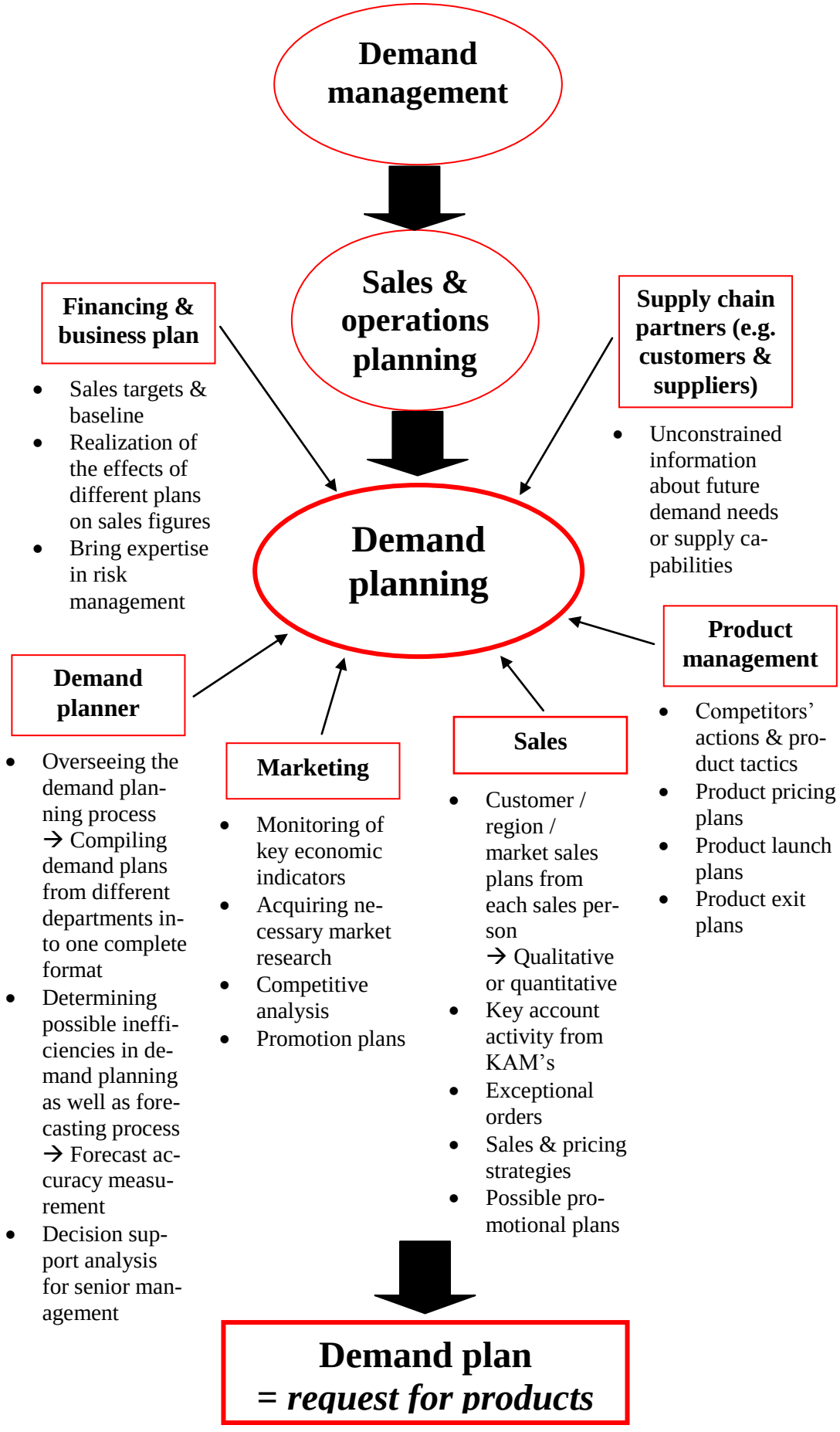

Figure 9 Participants and their possible inputs into the demand planning process

The above figure depicts the cross-functional nature of demand planning. Despite the fact that sales personnel are often considered to be the leaders of the process, participation from several other functions is of utmost importance. Giving and receiving feedback from trading partners and people within the company is considered as one key to demand planning process's success. Feedback promotes motivation and learning, which are important elements especially in such a challenging process as demand planning. However, feedback often is non-existent as it is considered to be unimportant. Documenting the assumptions upon which the demand plan is based is one success factor as well. If a company wishes to improve demand plan accuracy, the made assumptions need to be carefully reviewed, challenged and updated (e.g. Wallace & Stahl 2008, 21; Crum & Palmatier 2003, 37). Moreover, the importance of training personnel who are involved in demand planning is strongly emphasized. This is perhaps a reason why several companies invest in specific roles of a full time demand planner. The demand planner is in charge for overseeing the demand planning process by making sure input is received from the required departments and determining improvement suggestions for possible inefficiencies.

When discussing about demand forecasting, the forecasting process itself contains much more than learning about new forecasting models and software tools. Organizations should put more emphasis on the process itself, not merely on the tools that create forecasts. (e.g. Foster 2008, 2–3; Langabeer & Stoughton 2001, 7; Mentzer et al. 1999.) Launching SOP is believed to help organizations use information more collectively and improve the quality of forecasts (e.g. Katz 2010; Foster 2008, 3; Stitt 2004, 11). Nevertheless, a statistical method of forecasting is considered to bring additional value. Perhaps even more accurate forecasts may be created when forecasting software that uses some method of statistical forecasting would be acquired. There are several methods for forecasting; quantitative, that use mathematical modeling, and qualitative, that use people's experience and judgments of managers. From quantitative methods, time series analysis is considered to be the most popular method for statistical forecasting. Additionally, it is extremely important that organizations analyze forecast errors and use this information for learning and adjusting their forecasting practices accordingly.

A general conception is that demand planning processes will be improved when demand data is used more efficiently and increased visibility of downstream data may be obtained. POS data and channel customers' inventory data both are useful information. By using strategies such as VMI, the supplier may observe directly, for instance, inventory level or sales, and then base replenishment decisions on their own. In addition, the usage of POS data in planning demand and enhancing the performance of the supply chain is widely agreed upon (see e.g. Chase 2009; Gallucci & McCarthy 2009; Shapiro 2009; Kaipia et al. 2006). Probably the most widely used approach for applying POS data in the demand planning process is to use POS history as a reference. However, it is

a common opinion among researchers that especially during such ever changing economic times, relying merely on historical demand information is not the most reliable way to predict future demand (see e.g. Lapide 2009; Gung et al. 2002; Helms et al. 2000, 394; Langabeer 2000, 70). An improved approach would be to use all available market data and intelligence for demand analyses; not merely sales history. Collaborative forecasting is a concept similar to demand planning. Namely, in both approaches, information to plan and understand demand is gathered from several departments within the firm, customers and marketplace. History is taken into consideration, but in decreasing amounts.

5 METHODOLOGY

5.1 Research strategy

This research was written on assignment by a global organization and more specifically, on assignment by one profit unit within this organization, referred to as the case company. *A case study* was selected as research strategy since it aims in understanding the dynamics present within the case environment. It is a commonly used research strategy when contemporary events are being investigated. (Eisenhardt 1989, 534.) Furthermore, case studies often are the preferred strategy when a process is in the focal point of a study (Hirsjärvi et al. 1997, 126). Being an extremely popular research strategy, a case study aims at understanding the studied case and for this to succeed, the case needs to be investigated in relation to its historical, economic, social, technological and cultural context (Eriksson & Kovalainen 2008, 115−116). The unique strength of a case study is its ability to combine a variety of research evidence and data collecting methods, such as documents, interviews, questionnaires and real life observation (Yin 2003, 8). The collected evidence may be qualitative, quantitative or both (Eisenhardt 1989, 534−535). A case study is distinctively the right choice of the research strategy when a "how" or "why" question is being asked about a contemporary setting of events. In addition, the researcher has little or no control over these events. (Yin 2003, 9.) To be more specific, *a single case study* was chosen instead of a multiple case study because the assignment covered only one case. Case studies are often assumed to be more holistic than other types of business analysis. However, case studies are not constrained to be structured as scientific propositions. Therefore, they cannot be used to create formal empirical generalizations although the expectation is that the situation of the case is somewhat "typical". (Barros 2003, 39.)

This research also fulfills the criteria for *an intensive case study*. An intensive case study focuses on one or a few cases and attempts to find out as much as possible from this one case, or a few cases (Eriksson & Kovalainen 2008, 118). Intensive research explains causal relations by showing how cause and effect occur over time, and how people act on intentions based on their interpretations of cause and effect (Stoecker 1991, 95, 104). The chosen case is usually unique or extreme in some way. The purpose is to explore the case from the inside; the researcher tries to understand the events from those people's perspectives who are involved in the case. The aim is not to produce results that may be widely generalized, but to truly understand the one specific case. (Eriksson & Kovalainen 2008, 119, 121.) This thesis concentrated on understanding a process in the case company and investigating it within its true environment. The chosen case was unique since the case company had started to go through certain organiza-

tional changes and implementing SOP was in progress. Further, the author did not aim for wide generalizations; the results were produced for the case company's usage only. Due to these statements, it is correct to perceive this research as an intensive case study.

Yin (1994, 3−4) argues that a case study may be used for the following research purposes: exploratory, descriptive or explanatory. Hirsjärvi et al. (1997, 129) continue that it is possible for a research to have features from more than one type of such research purpose. Thus, due to the nature of research questions proposed in this thesis, the researcher suggests this study to have characteristics from both descriptive and explanatory research. *Descriptive* research purpose can be seen as the need to describe the current demand planning process in the case company and to document relevant characteristics concerning this process. *Explanatory* research, on the other hand, qualifies for this thesis as well since explanations for certain actions are being searched. In addition, the researcher studied the interaction as well as cause and effect relationships between people and activities. (Hirsjärvi et al. 1997, 129−130.)

Eriksson and Kovalainen (2008, 21−23), as well as Hilmola (2003), argue that there are two commonly used models of social science research: deduction and induction. Additionally, some researchers prefer to say their study follows abduction logic. With deduction, research relies on theory as the first source of knowledge. Research proceeds from theory, through hypothesis, finally to empirical analysis of the subject in question. Induction logic, on the other hand, uses empirical research as the basis for theoretical outcomes. Lastly, abduction refers to the process where everyday descriptions and meanings received from people create the basis for understanding and explaining a phenomenon. This logic is considered to have features of both deduction and induction. (Eriksson & Kovalainen 2008, 21−23.) Hilmola (2003, 48) concludes that most case studies are conducted by using inductive approach. Despite this statement, the inference logic used in this study can be described as mainly *deduction* since theoretical knowledge was heavily relied upon. However, certain elements from *abductive reasoning* may be found within this research. The abduction research logic is depicted in below Figure 10.

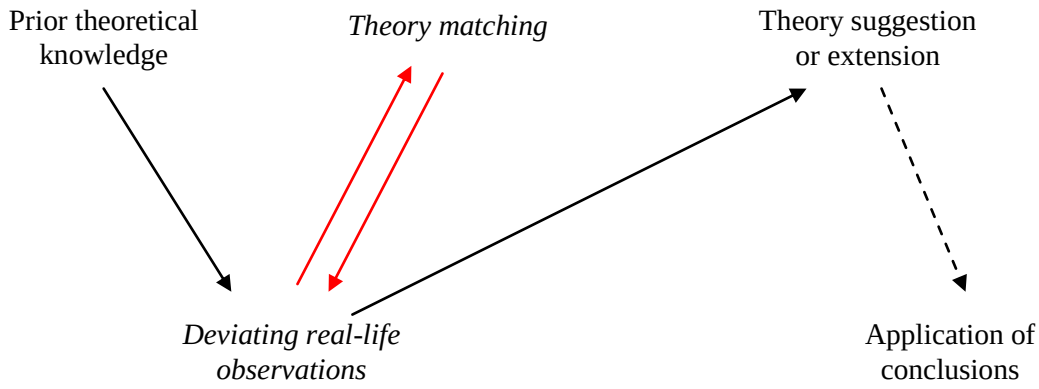

Figure 10 The abductive research process (adapted from Kovács & Spens 2005, 139)

In this thesis, theory and empirical observations together have been forming an iterative process throughout the research. Dubois and Gadde (2002, 555) approach abduction by describing its logic as *systematic combining*; a researcher goes back and forth between theory and empirical observations. The confrontation of theory and empirical evidence is more or less continuous throughout the research process, which may expand the understanding of both theory and the studied empirical phenomena. True abduction approach was, nevertheless, not used since the final phase concerning application of conclusions was not in the scope of the thesis. Deductive research has been identified to be dominant in logistics research (Kovács & Spens 2005). However, Kovács and Spens (2005) have expressed the need for more abductive research in the field of logistics.

5.2 Data collection

Since it was a process that was studied, a profound view of the case company's current activities related to the process of demand planning needed to be created. Therefore, close cooperation with the case company was required. The author was able to familiarize herself with the case company and study how the business worked. Thus, she realized this particular profit unit was an ideal target for this research. Namely, there was a strong urge to improve operations relating to planning demand in the case company. It was decided to implement the SOP process in order to improve demand supply matching activities. Hence, this study covered the starting phase in SOP: demand planning.

This thesis was conducted as a *qualitative research* since the objective was to analyze events occurring within real life context. This is a distinctive feature of qualitative research which is acknowledged by a wide range of researchers and experts (see e.g. Silverman 2006; Hirsjärvi, Remes & Sajavaara 1997, 152; Miles & Huberman 1994). Qualitative research is an empirical and socially located phenomenon, and is defined by its own history (Kirk & Miller 1986, 9−10). Further, according to Hirsjärvi et al. (1997, 155), flexibility of the research is a typical characteristic of qualitative research. This applied to this thesis as well, namely it was possible for the author to alter the research questions along the way. Data collection in qualitative research is often comprehensive in nature (Hirsjärvi et al. 1997, 155). Miles and Huberman (1994, 1) continue that qualitative data can be considered as the source of rich descriptions and explanations of processes in identifiable local contexts. With this type of data researchers are able to maintain the chronological flow in processes; they can see precisely which events lead to which consequences. Similarly, Silverman (2006, 43−44, 113) argues: "The main strength of qualitative research is its ability to study phenomena which are simply unavailable elsewhere."

Being a qualitative research, *qualitative data collection methods* were used. Silverman (2006, 18−19) identifies four major methods that are prevailing amongst qualitative research: observation, analyzing documents, interviews and focus groups, and audio and video recording. When dealing with case studies, Yin (2003, 83) argues that evidence for case studies may be collected from six sources: documents, archival records, interviews, direct observation, participant observation and physical artifacts. Interviews, observation and documents were chosen as qualitative data collecting methods in this particular study, from which *interviews* were the most important tool used. Additionally, a few persons were asked a couple of questions via email; it was considered to be appropriate since the amount of questions presented was only one or two. Hirsjärvi et al. (1997, 194) regard interviews often to be the main data collection method in qualitative research. Interviews were chosen as the primary data collection method due to the reason that through interviewing personnel from different departments the author was able to gain deep and wide knowledge about the research subject. In addition, as an advantage served also the possibility to present specifying and clarifying questions along the interviews. The conducted interviews were semi-structured in nature and they were recorded with a digital recorder. The duration varied from 30 minutes to one hour. In total, 14 interviews were conducted: 13 interviews at the case company and one interview at one customer organization. The representative of the customer organization was interviewed in order to enable comparison of the case company's demand planning process with the corresponding process in the customer organization. This particular interview was conducted via telephone. The company belongs to the case company's most important customers and is a well-known actor in its industry. Due to these reasons, this particular company was chosen. All the interviews were held in Finnish. Therefore, it should be mentioned that the direct quotations from the interviews in the empirical study are translations. The timetable for the conducted interviews is summarized below in Table 4.

Table 4 Timetable for conducted interviews

Interviewee	Position and responsibility of the interviewee	Date of the conducted interview
Logistics manager 1	Sales logistics team leader	October 5th, 2011
Sales manager 1	Team leader in sales team 1	October 7th, 2011
Logistics manager 2	Inbound logistics team leader	October 13th, 2011
Production manager 1	Supervisor at a MTO production line	October 14th, 2011
Sales manager 2	Team leader in sales team 2	October 18th, 2011
Business analyst	Business Unit business and marketing analyst	October 19th, 2011
Sales manager 3	Regional sales manager	October 24th, 2011
Production manager 2	Production planner at a MTS production line	October 27th, 2011
Sales manager 4	Account manager	October 28th, 2011
Production director	Head of production and logistics	November 1st, 2011
Sourcing manager	Manager in sourcing team	November 3rd, 2011
Sales manager 5	Market sales manager	November 9th, 2011
Demand manager in the customer organization	Leader of global demand management	December 16th, 2011
Product manager	Manager from product management department	December 19th, 2011

The interview outline was prepared beforehand and sent via email to the interviewees a few days prior to the interview took place, enabling the possibility for preparation. Each question was not presented to each respondent (see Appendix 2), as the respondent's position in the company needed to be taken into consideration. During the interviews, when found necessary, it was possible to change the order of the questions. This gave the interview a feeling of naturalness. As Eriksson and Kovalainen (2008, 82) and Blakeskee and Fleischer (2007, 132) also state, the advantage with semi-structured interviews is that the atmosphere is relatively informal and it is typical that the order of the questions may change during the interview. Despite this fact, the materials are somewhat systematic and the interview has a clear direction to where it is going and what questions need to be looked through. (Eriksson & Kovalainen 2008, 82.)

The second type of data collection method used in this study was *observation*. In addition to Silverman (2006, 18−19), Blakeslee and Fleischer (2007, 109) explain that almost all qualitative research involves observation at least to some extent. During this research process, the researcher acted as an observer in several meetings relating to the improvement of sales processes in the case company. In these meetings, the researcher

adapted the role of an observer by merely listening and learning instead of trying to continuously participate in the conversation. According to Eriksson and Kovalainen (2008, 87), this type of behavior can be regarded as *direct*, or *non-participant observation*. The third qualitative data collection method from Silverman's (2006, 18−19) and Yin's (2003, 83) list was *the analysis of documents*. Such documents may take many forms (Yin 2003, 85). In this study, the examined documents consisted mostly of Excel sheets containing numerical data of actual sales and forecasted sales figures. Hirsjärvi et al. (1997, 175) refer these types of prepared materials to secondary data; the researcher has not collected the information personally. The analysis of these documents allowed the researcher to give solid basis for the statement that there is much room for improvement in the forecasting process.

5.3 Analysis methods

It is peculiar for qualitative analysis that the researcher begins to analyze and contemplate what things truly mean from day one. That is, analyzing for example regularities, patterns, explanations and causal flows is usually done along the way; not only at one stage of the research. (e.g. Blakeslee & Fleischer 2007, 172; Hirsjärvi et al. 1997, 211; Miles & Huberman 1994, 11.) This was also the case in this thesis as analysis was being made throughout the research process. *Methods* are the specific research techniques used in a study (Silverman 2006, 13). The methods for qualitative data analysis in this particular study consisted of four activities: data reduction, data display, comparison between the processes of two companies, and conclusion drawing from all gathered information. The researcher found *data reduction* to be a necessary method because of the large amount of collected evidence. Data reduction is the process of selecting, focusing and transforming the information gathered. (Miles & Huberman 1994, 10−11.) As the interviews were transcribed, and the interviews and excel documents were read through several times, the researcher was able to gain a broad understanding on the findings and general themes within them. In addition, differences in opinions among interviewees were found. Data reduction was being used here to identify the most significant issues and to screen out the unnecessary, non-value adding information.

Data display is an organized assembly of information that allows and facilitates conclusion drawing (Miles & Huberman 1994, 10−11). In this study, displaying all gathered data in a systematic and clear way helped the researcher to gain a complete view on the subject. As the amount of information was large, this analysis method was proven to be extremely useful. *Comparison* was chosen as a method for analysis in this thesis since the results from the interview with the customer organization were compared with evidence gathered from the case company. The final method of analysis was *conclusion*

drawing. (Miles & Huberman 1994, 10−11.) Conclusions were drawn from the empirical material with great emphasis on the theoretical framework as the basis for the results. In this phase, the researcher contemplated how the results would assist the case company to concretely improve their demand planning process and thus, achieve a more accurate demand plan.

5.4 Reliability and validity

Reliability refers to the degree to which the findings of a study are independent of accidental circumstances (Kirk & Miller 1986, 20). The concept measures how possible it is for other researchers to repeat the exact same research in the future and receive the same results (Silverman 2006, 282). *Validity* refers to the degree to which the findings of a study are interpreted in the right way (Kirk & Miller 1986, 20). In any given research, conclusions drawn from the material need to be verified (Miles & Huberman 1994, 11). Furthermore, Kirk and Miller (1986, 10, 13, 20) discuss the term of *objectivity*. It refers to the assumption that, in principle, everything can be explained in terms of causality. This presumption qualifies to scientific research as well; the researcher needs to be able to present the steps and phases that have led to the final conclusions. The objectivity of a research can be obtained by the simultaneous realization of as much reliability and validity as possible.

The concepts of reliability and validity may be approached more widely by referring to Yin's (1994, 33; 2003, 33−34) well known perception of these. Namely, Yin has identified four tests that have commonly been used when establishing the quality of any empirical social research. Since case studies may be classified as one form of such research, the four tests are applicable to case studies as well. The four tests are as follows: 1) construct validity, 2) internal validity, 3) external validity, and 4) reliability. *Construct validity* tests the establishment of correct operational measures for the concepts that are being studied. (Yin 1994, 33; 2003, 33−34.) Using multiple sources of evidence, namely interviews, observations and prepared documents, was the tactic being used to increase construct validity in this study. Such tactic is often referred to as *data triangulation.* In addition, *theory triangulation* was being used as well since several theories were used in explaining the empirical results. (Eriksson & Kovalainen 2008, 292−293). *Internal validity* tests the establishment of a causal relationship, where certain conditions are proven to lead to other conditions. This test qualifies only for causal and explanatory case studies. (Yin 1994, 33; 2003, 34.) This study was descriptive and explanatory in nature; therefore internal validity can be tested to some extent. Tactics to increase internal validity of this research consisted of explanation building as well as explaining rival explanations for the main concepts. *External validity* measures to what

extent the findings of a research may be generalized (Yin 1994, 33; 2003, 34). This test was somewhat problematic in this study as single case studies do not aim for wide generalizations. However, despite the fact that the empirical findings applied to only one case, the presented theoretical framework could be generalized more broadly. *Reliability* tests whether the conducted research may be repeated with the same results or not (Yin 1994, 33; 2003, 38). Testing for reliability in this study was difficult because the generated findings resulted from real life phenomena occurring in real time. Therefore, the situation at the case company would not be similar in the future. Nevertheless, it can be stated that if any other researcher would have conducted this research at the same time as the author, they would have received similar results. This is because the research steps were planned ahead and all phases in the research process were well documented.

6 EMPIRICAL STUDY

6.1 Case company information

The case company is a leader in its industry. The organization to which the case company belongs to operates in over a hundred countries and employs more than 100000 people. The organization's business is based on a divisional structure. The divisions are further divided into Business Units (BUs) and the case company is one profit unit within one BU. (Case company website.) The case company itself employs more than 300 people at the moment in Finland (Human resources manager). The products they offer allow their customers to improve their operations. The lead times for these products varies from less than a week to several weeks, or even months when demand is great. The case company's end customer base ranges from small companies to original equipment manufacturers (OEMs). However, it should be emphasized that the case company sells its products to internal customers and therefore, is not in direct contact with its end customers. Thus, when referring to customers in this research, it is actually referred to other companies within this same organization around the globe. Although this thesis concentrates on the one profit unit in Finland, the global context is constantly present. Since the sister factories manufacture some of the same products as the case company, they may share their manufacturing capacity when the case company cannot meet customer demand by itself.

The case company uses SAP as their ERP system. Through the use of SAP, operations may be conducted in a more unified and efficient manner. The production lines within the case company manufacture according to MTS strategy as well as MTO strategy. As this study centers on operations on the demand side, it is necessary to explain the structure of sales organization in the case company. There are five separate teams of sales managers who each have different sales responsibilities. In addition to all sales teams and their team leaders, the Sales director is in charge of the case company's sales as a whole. *Sales team 1* sees to the business in North, Middle, South and West Europe. The business areas these sales managers are responsible for covers approximately 50% of the case company's total business. (Sales manager 1.) This sales team overlaps with many of the other sales teams, as their business includes basic business from, for instance, sales team 2. *Sales team 2*, on the other hand, does not have any particular country responsibilities. They are KAMs and thus, they handle OEM customers and give support to other sales managers in their country specific issues. Most of their support goes to the sales team 1 as well as sales team 3 since most of the key account customers are located in the countries managed by these sales teams. (Sales manager 2.) *Sales team 3* is responsible for certain regions. For instance, Latin America is considered as

one region and is under the responsibility of one sales manager. The regions are even further divided into smaller areas each area belongs to one sales manager. These sales managers then answer to their superior responsible for the entire region. *Sales team 4* handles the business in one specific industry. This team's business area covers only one product family due to the suitability of the one product family in this particular industry. Lastly, each manager in *sales team 5* covers the business within a certain market. Their basic business is included into the sales of sales team 1.

6.2 Current demand planning process in the case company

6.2.1 Conception of demand planning

The research problem in this study was *to identify improvement suggestions in the demand planning process for stable products which may assist the case company to achieve a more accurate demand plan*. Through this, the author implied that the entire DM process would start improving. The research problem was divided into two specifying questions. This chapter provides answers to the first specifying research question: *How does the demand planning process work currently with stable products in the case company?* Reeder and Rowell (2001, 6) state the following: "An improved process is based on a sound understanding of existing processes." Many organizations recognize the need to improve processes if outputs are to be enhanced. In fact, the improvement in performance begins with understanding the structure of the process. After this comes the identification of the critical process inputs and phases that affect the entire process performance. (Christopher 1998, 107–108.) Therefore, the existing demand planning process in the case company needed to be studied to begin with, in order to gain insight about what could be improved. When discussing current demand planning in the case company, it needs to be noted that current time refers to time before actual SOP implementation.

Demand planning refers to the process of predicting future sales. Therefore, it is vital to include all available information within the supply chain that could be useful. (Stadtler & Kilger 2002, 125.) Current demand planning process in the case company may be described as relatively *unilateral* in the sense that many possible information sources are being left out from demand analyses. The fact that the case company uses internal customer sales strategy may have some effect on the degree and quality of information sharing since sales personnel are not in direct contact with end customers. As Logistics manager 1 commented, the local company in between the case company and the end customer might either filter or strengthen the information shared. In general,

demand planning is seen in the case company as the process through which the company may answer to the upcoming demand. Its importance as *one key business process* is well understood. As Sales manager 2 concluded, efficient demand planning improves the case company's abilities to serve customers and therefore also deepens customer relationships. Even though Business analyst had never heard of the term demand planning before, the interviewee commented as follows:

> *Who can predict demand the best and who are most prepared to the volatility and rapid changes of demand; these are the most critical issues.*
> (Business analyst)

During the research it became clear that demand planning is regarded as *synonymous with demand forecasting*. Sales manager 1 explained his conception on demand planning briefly:

> *I think demand planning refers to the forecast; it is the process where we give the forecast to our production.*
> (Sales manager 1)

In addition, Logistics managers 1 and 2 stated, the monthly forecast meeting is the place to plan demand. As a conclusion, the same people who participate in the forecast meeting participate in demand planning as well. Considering forecasting equal to planning is nevertheless an incorrect way of thinking, which has been stated by many researchers (see e.g. Mentzer & Moon 2004, 41; Crum & Palmatier 2003, 26). A forecast should be prepared beforehand to support the plan, or in other words, to drive the plan. Despite this, the basic structure underlying the demand planning process, or forecasting process in the case company's current situation, was generally understood well. However, nearly all of the interviewees understood demand planning as something that reaches all the way to production and capacity planning. Sales manager 4, for example, explained his view on the concept of demand planning as thus:

> *It starts from the need to understand your customer and their wants, and how much their demand is going to be. So the information starts roll through sales over to production. And then logistics, once the order is ready.*
> (Sales manager 4)

In principle, this conception is not incorrect. It merely goes a few steps too far from the range of actual demand planning; production and logistics have their roles once a demand plan is first being prepared at the demand side of operations.

6.2.2 Current input into demand planning

The situation in the case company may be further described by explaining demand planning from an operational point of view; which people and functions are involved and what is their contribution to the process. Based on the demand planning framework in Figure 9, the below Table 5 summarizes the present structure of the demand planning process in the case company.

Table 5 Current input into demand planning

Function	Current input
Production & logistics	• In charge of the forecasting process; thus, in charge of the demand planning process
Sales	• Creates relationships with customers • Sales managers receive demand forecasts from some countries and customers → not every sales team provides input into monthly demand forecasting
Business analyst	• Analysis of business intelligence data mainly on BU level → is not being used in demand planning
Product management	• Input minimal, particularly in products' stable phase • Two main functions: 1) competitor analysis is being made, but cannot be regarded as input in understanding demand 2) basic pricing, however does not always work as should
Controller	• Input almost non-existent • Occasionally controller assists is turning sales figures from Euros into units
Sales budget & strategy	• Sales targets → guide certain sales teams slightly more than it should • A large part of future sales is taken into consideration only in the budgetary forecast, not in monthly forecasts
Demand planner	• Such role does not exist in the case company
External partners (such as customers and suppliers)	• Some customers provide demand forecasts; a wide range of customers are unable to provide them • Suppliers do not take part in the case company's demand planning

Until now, demand planning has been referred to as demand forecasting. Therefore, the author concludes that a true demand planning process has not existed in the case company. In the present situation, it is not sales department that carries the main responsibility for planning demand, or forecasting demand more precisely. Naturally, *sales* has been responsible for selling and building relationships with customers, but not all sales teams have participated in the monthly forecast meeting held in the case company. Instead, it has been *production and logistics* functions who have taken on the largest role. The Chapter 6.2.4 explains the structure of the forecasting process in more detail.

The function of the case company's *business analyst* within the marketing function is to prepare business intelligence data for entire BU which may be found in the case company's Intranet (Business analyst). However, until now, business intelligence data in the form of *different market studies and analyses* has been minimally exploited when planning demand in the case company. Such information is not considered to be important for demand analyses. Nevertheless, within the case company's industry, there are two important market research facilities. Studies from both facilities are purchased yearly. Business analyst analyses these studies on BU level, prepares summaries and forwards them to senior management, product management and places them into the case company Intranet. In the Intranet, Group Function - Corporate Strategy (GF-CS) has created a portal called Corporate strategy. This strategy portal provides consistent up-to-date information and resources for all employees across the entire organization. The global Business Intelligence Portal (BIP) can be found through this path. The whole organization wide intelligence network is led by GF-CS with a dedicated team that focuses on competitive, market and macroeconomic intelligence. Within the intelligence network, BIP is accessible to all employees where divisions and BUs share competitor profiles and market research reports. (Case company Intranet.) Additionally, Market Data Repository (MDR) is a collective organization wide tool where market information is globally gathered. Furthermore, moving from a corporate-wide context to a more localized one, the marketing and sales activities in the division, to which the case company belongs, are supported by a marketing intelligence network that comprises of representatives from each business unit in this division. The main tasks of the market intelligence network include mapping the competitive landscape, analyzing customer behavior and cooperating with research agencies and purchase reports that are relevant for this particular division. Much of the information gathered by the marketing intelligence network can be found from BIP. (Case company Intranet.)

In literature, it is widely acknowledged that business intelligence information in all forms is beneficial when planning for future demand. Market intelligence is, according to for instance Hellriegel (2009, 13), crucial to the development of an accurate forecast. Many companies, however, find it difficult to obtain. This statement is completely true

when referring to the situation in the case company. A general opinion among the interviewees was that such information is extremely *difficult to use* and even more *difficult to obtain*. As Sales manager 4 concluded, a great challenge is to even find the market intelligence studies in the Intranet. In addition, when this information ultimately is found, another challenge arises; how to use and read the available information. Furthermore, despite the fact that market intelligence data should be one vital input to demand planning, the Business analyst was not at all familiar with the concept of planning demand. The respondent commented the collecting and preparing of market intelligence data in the following way:

> *Market intelligence is gathered through many paths. We have one corporation level tool, MDR, where market information from sales companies is collected. This is numerical information concerning the size of the market, the organization's sales volumes during that year and our greatest competitors' sales volumes during that year. But one should notice, that all this is historical information gathered during spring from the previous year.*
> (Business analyst)

To conclude, market intelligence data from portals such as MDR is currently not being used as an input in demand planning. Cooperation between sales managers and the business analyst is extremely minimal (Business analyst). Interesting was to discover that *opinions on the usefulness* of market studies when planning demand were quite *dissenting*. Some, such as Sales manager 1, 2 and 4, were strictly of the opinion that studies on the products' market changes and changes in trends could not bring any additional value into demand forecasting. Even if they were better available. As Sales manager 1 concluded:

> *Personally, I do not see that it would bring any benefits to forecasting if we in some way reflected market studies on how our products' markets will change. I would not start using such information as an indicator of sales. The best way to receive insight on future demand is to simply ask from the countries directly that how the situation looks.*
> (Sales manager 1)

According to Sales manager 4, market research data may possibly inform about the direction to where the industry is going over long-term horizon. But such information brings no additional value to operational planning, such as when predicting next year's demand. Then again, Sales manager 3 commented on this subject as follows:

> *I would find such general market studies extremely useful. If there were any, I definitely would look into them. They could provide some risk assessments about the future. However, there are not that many of them; there is one general study in our Intranet but that is about it.*
> (Sales manager 3)

The Sales manager 3 continued that the best case scenario would be if the prepared market studies would be available as country specific analyses. Such information would assist sales managers to understand their areas and customers better. Sourcing manager added that market research information could be useful for sourcing department as well, since they could exploit it in conversations with suppliers. Sales manager 5 responsible for a specific market in sales team 5 was the only sales manager who uses the prepared market research data. The respondent commented as thus:

> *I look at one study for information concerning my market area. I use this kind of information because it is relatively easy for me to use it since the market research facility prepares my market area specific research. And I am sure that other managers in my team use these studies as well. Although, it is true that they are not easy to find from the Intranet.*
> (Sales manager 5)

Product managers in the case company have adapted a strictly technical role. In the present state, they do not provide almost any input into the demand planning process; at least not when products are in the stable life cycle phase. Each product manager is responsible for gathering information concerning technical requirements for the products they are responsible for. In an ideal situation, they would use sales and customers as information sources and pass this information on to product development. However, at the moment it would seem that at least cooperation with sales department is minimal. Further, competitive analysis is being made in order to receive insight about competitors' weaknesses and the case company's products' strengths. Product manager stated the following:

> *Yes specifically competitor analysis we prepare a lot. Then of course when a product is being designed, we are there to make decisions about the product characteristics and how appealing it is going to be. Thus, our department is mainly involved when the product is in ramp-up phase. But once the product is in its stable phase and business is as usual, we do not participate that much.*
> (Product manager)

However, this information about competitors cannot be regarded as an input when planning demand since it is not being exploited when predicting future demand. All commercial approach, so to speak, is currently missing from the product managers' work description. (Sales manager 1.) Product manager added that they are involved in product pricing. Or at least they should be, since the respondent was not entirely sure whether pricing policy in the case company works the way it should. Further, it became apparent that product management is not interested in participating more in demand planning. The Product manager explained that it would not bring any additional value for them if they knew for example the decisions from the forecast meetings. The respondent stated it is enough that they may look from the Intranet current product availability situation. Only when large problems should arise, it would be beneficial when the product manager in question would know about the situation. To this issue the Product manager commented as follows:

> *We usually receive information about availability problems as second-hand, so to speak. There are intermediaries always in between. I'm quite sure it is due to the fact that we are not part of the demand planning process.*
> (Product manager)

Controller's input into demand planning has been minimal. At present state, the case company's controller has occasionally provided assistance with converting the monetary forecasts into unit forecasts. (Controller.) Even though, for example Chase (2009, 40) explains that the role of financing is in fact more of supportive nature when planning demand, there are possibilities to increase the case company's controller's participation in the process. For instance, according to Chase (2009, 40) a controller might assess the revenue implications of sales and marketing activities. *The case company's strategy and sales budget* provide directive guidelines, country specific and certain customer specific sales targets. During the research it was revealed, that the sales budgets guide demand planning perhaps too greatly in certain sales teams. As Crum and Palmatier (2003, 39) explained, there may be pressure to force the demand plan to match with the sales budget, or business plan, quite often. However, this is not a correct approach when reality shows that sales revenues will not most likely materialize at the rate presented in the business plan. One should not forget that the sales budget is, after all, only a target. Further, a specific role for a *demand planner* does not exist currently in the case company. Such persons are normally responsible for assisting and overseeing the demand planning, or forecasting, process. In addition, *external supply chain members* do not participate almost at all in planning the case company's demand at present state. Almost at all refers to the exception of certain countries and customers who are able to provide their demand forecasts to the case company's sales managers.

6.2.3 Demand forecasting practices

To this date, demand forecasting in the case company has been considered to be the demand planning process, as mentioned. Forecasting future demand has been relying mainly on *historical information*. The current forecasting practices have not been able to accurately predict, for instance, sales trends or seasonality. Among the interviewees, these issues have been found to be problematic. Furthermore, literature suggests as well that especially during such turbulent economic times, historical demand information should not be used as the basis for future plans (see e.g. Lapide 2009). Logistics manager 2 commented this matter as thus:

> *The main problem in the current way of forecasting demand is the fact that it is done by using only historical order information. Of course there are sales personnel present in the forecast meeting, but nevertheless, no one brings any other input besides historical order intake data.*
> (Logistics manager 2)

Logistics manager 2 further explained that the entire forecasting process in general could be somewhat better. For example, stock levels have not always been taken into account in the forecast meetings. Nevertheless, the interviewee was convinced that the SOP process implementation would bring improvements in the upper-level operations of demand forecasting, among other things. Demand forecasting is considered nearly unanimously to be *one key factor to success* in the case company. As Production manager 2 concluded, there must be some type of thread to lead the way and a demand forecast serves directly this purpose. A company cannot be ready for everything. Production manager 1 as well concluded that the case company requires demand forecasts to guide their manufacturing processes. One outstandingly differing opinion, however, arose among the interviewees. Namely, Logistics manager 2 started to doubt the whole purpose of forecasting demand.

> *I have begun to wonder that, after all, why do we even forecast and is it even possible to forecast the future? And when thinking about our current forecasting process, it is not about forecasting but about reaction time. We do not forecast; we react to order intake.*
> (Logistics manager 2)

Despite this objection against demand forecasting, it needs be acknowledged that without at least some assessment of upcoming demand, manufacturing has no basis on what to develop production plans. Logistics personnel as well have limited information

for developing any distribution plans. (Barr 2002, 28.) Furthermore, *the need to improve* the forecasting process in the case company is well recognized. Among the interviewees, many shared this view. Additionally, the conclusions drawn from the prepared Excel documents containing sales and forecasted figures supported this statement. Production director clearly indicated this need from his point of view:

> *Within our supplied base, we have long lead time components; therefore, we always need to forecast. We do not have that long an order book according to which we may order materials, but our order book is relatively short. Nevertheless, according to this order book we must know to estimate our demand.*
> (Production director)

Some interviewees, however, found the current state of forecasting to be sufficiently good. Production manager 1, for example, was of the opinion continued that the current forecasting process is working well since we are able to maintain good lead times and deliveries are reliable. However, the following comment from him also indicates the urge for a better forecasting process:

> *The greatest improvement to the process would be if we were able to determine the demand variability during the following six months more precisely. The more accurately we see into the future, the easier and more efficiently we can specify our resources for the whole production.*
> (Production manager 1)

No statistical forecasting method or software has been used in creating demand forecasts in the case company. Literature nearly always suggests exploiting statistical methods. For example, Chase (2009) is strongly of the opinion that most accurate demand forecasts are achieved by using statistical analysis of demand data. Moreover, some are of the opinion that a forecasting software would yield even better results. For instance, Croxton et al. (2002, 56) explain that if a company should decide to use a quantitative approach such as time series, they might consider using forecasting software to assist with the process. Logistics manager 2 commented that there are various computerized tools available that would assist in improving the outcome of forecasting. Even if the forecasts have been based on history, certain software would calculate future forecasts better than the current way of preparing forecasts in the case company.

> *From my experience I can say that when preparing demand forecasts based on historical sales data, the forecast is put roughly on the same level what it has been on. But if we calculate the forecast with software, it actually prepares all*

> *kinds of curves from the given data. Only by looking at the history one could never predict such forecasts what the software calculates.*
> (Logistics manager 2)

However, one must not forget that the forecasting process itself contains much more than learning about new forecasting models and software tools (e.g. Foster 2008, 3). *Measuring forecast accuracy* is found to be *extremely minimal* in the case company. Production line supervisors or production planners have been analyzing how the forecasted demand has deviated from actual sales on product level. But these analyses have not been widely handled and discussed (Production manager 1), and no other measurements for forecast accuracy have been established. Further, using the forecast errors in learning purposes has been non-existent. Among the interviewees, it was unanimously emphasized that the creation and usage of proper metrics would bring visible benefits into the forecasting process. According to several researchers as well (see e.g. Croxton et al. 2002, 61; Helms et al. 2000, 400–401), the measurement results can be used to improve forecasting and serve as incentives to the organization.

6.2.4 Process description for demand forecasting

In general, *production, logistics, purchasing and sales* personnel have been participating in the forecasting process. Further, it was revealed that production and logistics personnel have been carrying a leading role in demand forecasting. *A forecast meeting* is held every month; it has been the place where demand and supply side personnel have come together and demand forecasts have been created. In addition to this meeting, the case company's Sales director has prepared *a budgetary sales forecast* two times per year. This budgetary forecast can be considered as the background, or basis, for the actual demand forecasts. (Logistics manager 1.) Namely, the budgetary forecast is updated a few times per year according to newest knowledge and predictions on upcoming demand; the budgetary forecast should be more or less in line with the actual demand forecasts prepared each month and vice versa. Sales director explained that the budgetary forecasting process consists of three phases. First, historical sales data regarding the development of sales as well as its trends is examined. Second, target level versus company strategy is compared; what should be put the most effort in since everything cannot be achieved with limited amount of resources. Third, external factors such as global development of industrial production are taken into consideration. These three factors form the budgetary forecast which is divided according to product groups. According to Sales manager 2, it is important to make sure that the budgetary forecast and the monthly prepared forecasts go somewhat hand-in-hand.

But then it is a whole other issue that which one of them, the budget or the monthly forecasts, is correct.
(Sales manager 2)

The chair in the monthly forecast meetings has been Production director. Representatives from several departments have taken part in the meeting. However, according to Logistics manager 1, in principle all the necessary functions have been represented in the meeting. Nevertheless, certain people have not been participating at all regardless of their strong input as well as dependence on the created demand forecasts. The process description for the meeting is depicted in below Figure 11.

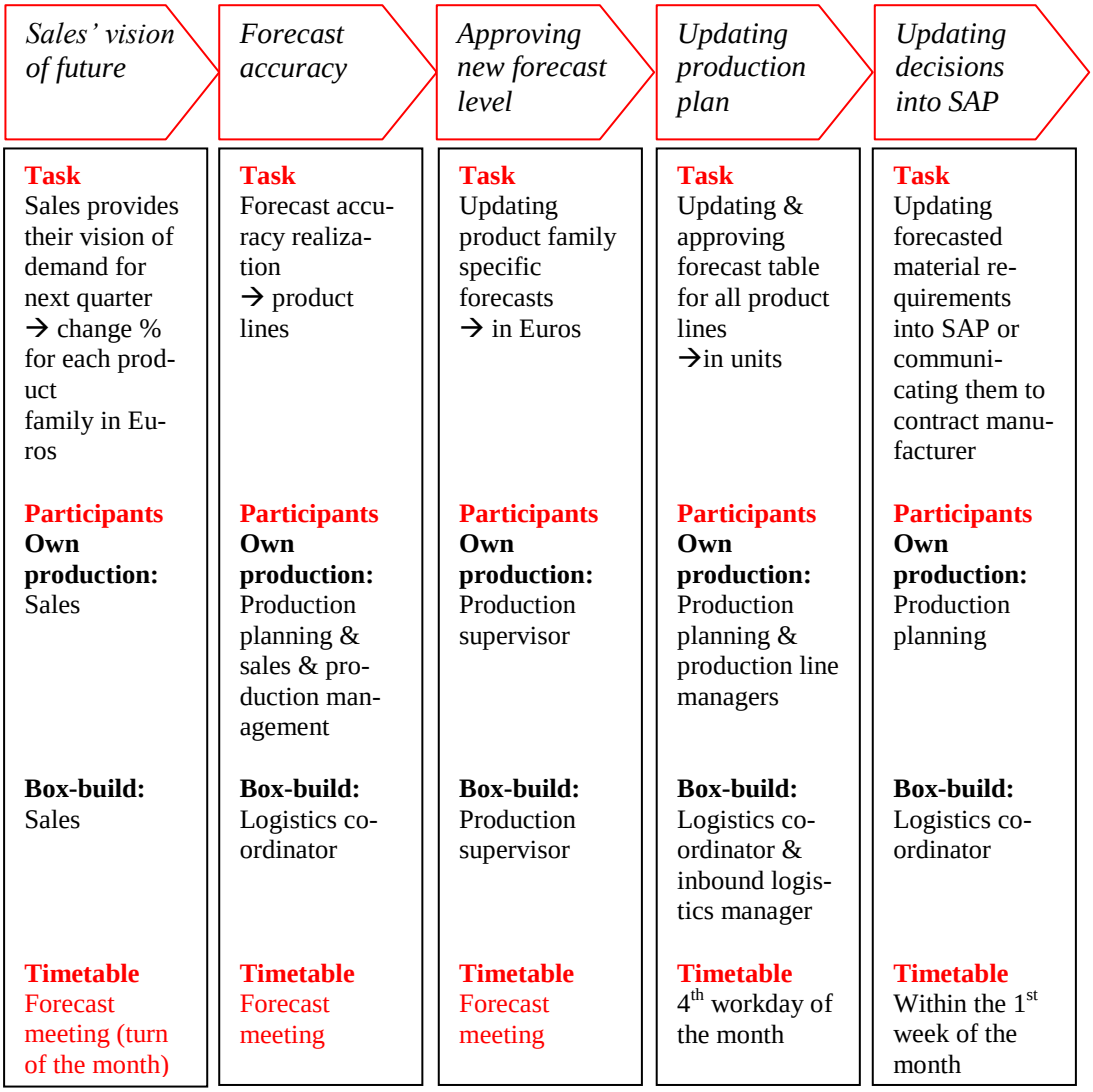

Figure 11 Case company forecasting process (adapted from case company Intranet, Production director)

As the process description for demand forecasting indicates, production and logistics are the departments in charge of the forecasting process. Naturally, sales provides their

input in the first phase, but the following phases in the process are carried out by production and logistics personnel. Box-build production refers to case company's contract manufacturers to whom they have outsourced the production of certain products. Production manager 2 commented to the forecasting process with box-build suppliers as thus:

> *The goal is to forecast and then also take the same amount of products from box-build suppliers. In other words, we try to keep the process as simple as possible. We are the leading actors and they produce the quantities.*
> (Production manager 2)

Production manager 1 is of the opinion that the forecast meeting is a meeting for sharing long-term information, where sales also presents their view. The following comment from Production manager 1 confirms the indication that production carries a lot of the responsibility for forecasting demand.

> *But what comes to the near future, we follow actively our order book; how many placed orders we have in our systems. Regardless of information from sales, I follow the order book on a daily or weekly basis.*
> (Production manager 1)

It was revealed that even though sales has been represented in the forecast meetings, the input brought from the sales representative has covered only *a part of the case company's entire sales*. Namely, the only sales figures brought to the meeting have come from Sales manager 1 representing the sales from *sales team 1*. In rare cases Sales director has presented these figures. To conclude, the prepared forecasts in the forecast meetings have taken only the business from sales team 1 into account. This sales team's business represents approximately 50% of the case company's total sales that is generated only from European countries. Naturally, the budgetary forecast prepared two times a year covers all sales. But nevertheless, the created forecast from the forecast meetings has been the guideline for operative plans, such as production planning and sourcing. However, one important issue needs to be realized. *Basic business from OEM customers and certain market areas* are included in the European areas handled by the sales team 1. Therefore, despite the fact that only approximately 50% of total sales has been taken into account in the forecast meetings, sales from some OEM customers and customers within the range of sales teams 4 and 5 are included into this 50% of sales. Sales manager 1 commented on this issue as follows:

> *What comes to the forecasting process and forecast meeting, the sales team 5, for instance, has not participated at all. Of course the business runs through our team, but we are not able to see if suddenly an international OEM moves their production to India or something else unexpected occurs.*
> (Sales manager 1)

Sales manager 1 commented that he has been quite satisfied with their way of forecasting. The respondent explained how the forecasted demand figures within the area manager team are formed:

> *It is relatively easy for us to forecast the "basic business". We prepare once a year a budget with our countries and discuss how much is the expected growth percentage per product group. In addition, we have asked our countries their forecasts once every quarter where change percentage for growth is compared to the previous quarter.*
> (Sales manager 1)

Other sales teams have had their own ways of forecasting that have *not been according to any predetermined process*. There has been no common and unilateral structure for all sales teams when forming demand forecasts in the case company. This fact is bound to cause problems. As Croxton et al. (2002, 55) comment as well, a firm will most certainly lose control over the forecasting process if managers of each function or different sales teams generate independently their own forecasts. *Sales team 2*, as in the KAM team that supports other sales teams, has not prepared any other demand forecasts than a yearly budget which has then been monitored throughout the year. However, as stated, KAM team's basic sales figures have been included into area manager team's sales. (Sales manager 2.) The problem has been all unexpected events or projects occurring with OEM customers which area managers have not been able to see, as Sales manager 1 concluded. Further, Sales manager 3 from *sales team 3* explained that similar to sales team 1, their countries themselves prepare the demand forecasts. They are done, however, only once a year and concern the entire division. The countries report the forecasts into the division and the regional managers receive an Excel format from these forecasts. However, the interviewee concluded that the received demand forecast figures are not necessarily that reliable. At least in respondent's sales region a big problem is the reliability of basic data. In addition, the Sales manager 3 explained the following:

> *I prepare a forecast to the end of the year and then each month I correct it if necessary. This is my own opinion about my countries. I look from the history and then add upcoming projects on top of it.*
> (Sales manager 3)

Usually these forecasts are forwarded in writing or orally to BU sales manager. From there the demand figures are included into the budgetary forecast when it is being prepared. (Sales manager 3.) The interviewee explained further that since their sales team does not take part in the monthly forecast meetings, they normally receive an Excel sheet containing the outcomes of the meeting. Sales manager 4 from *sales team 4* explained that in normal business, demand from their sales team is included in the forecasts of sales team 1. In addition, the interviewee commented that the sales budget is being made, but it is perhaps slightly unreliable a leader for operations. Nevertheless, it gives enough direction to be able to live. The interviewee, however, implied here, that it is an entirely another issue, whether the sales budget has anything to do with reality. Further, Sales manager 5 within the *sales team 5* explained about the forming of demand forecast as thus:

> *I prepare a demand forecast every year and each quarter I review it. I gather the forecasts for my market area separately from each sister factory. In addition, we try that each country would prepare an own plan for this market area that would contain knowledge about the market size and potential in this country. But such plans are extremely difficult to get from some countries.*
> (Sales manager 5)

In addition, the interviewee explained that the prepared forecast has been forwarded to a global team for this market area which contains the forecasts from all BUs. In addition, the forecast has been communicated to area sales directors. In the present model, market managers do not participate into budgeting at all. The Sales manager 5, however, was strictly of the opinion that it would be important to include them into the budgeting process.

The outputs of the forecast meeting have been presented *only in Euros*, not in units. This has caused difficulties and additional workload for production, since they have been forced to convert the monetary forecasts into unit forecasts. Especially Production manager 1 was strongly of the opinion that this matter has been extremely problematic, at least at their MTO production line.

> *It is a big job. Even at the moment, we have a production planner working on this. We need to make a hundred-line calculation with Excel only because sales*

> *presents only the millions for each product family. After we receive this information, we decide on the product mix based on four months of historical data. This way we see the relationship according to which we split the one big sum between all the products.*
> (Production manager 1)

Production manager 2, on the other hand, contemplated this to be more challenging at other production lines. At their MTS production line the splitting of the mix is not that time consuming a task. They do this only once a year since the mix hardly changes. Sales trend is the one influencing factor that is closely followed. Production manager 1 continued by stating that the calculation process may affect the validity of the demand forecasts. The prepared forecasts might not be materialized as they were meant to because of the impossible task of accurately converting Euros into units. He concluded that there is an obvious *difference between the mindsets of production and sales*. Namely, production is only interested in unit forecasts. Sales, on the other hand, does not necessarily have any idea about number of units sold since they only have sales targets for how much money needs to be generated. Sales manager 4 explained his view by stating that demand forecasts are prepared in money and that is what matters to sales. Lapide (2007b) as well as Mentzer and Moon (2004, 39) argue, typically there is a serious disconnect between the demand and supply sides in many organizations. This statement qualifies for the situation in the case company. The managers on the supply side are focused on minimizing costs and inventories, while the managers on the customer side concentrate on maximizing revenues. Processes within DM, such as SOP including demand planning, are there to bridge the wide gap between these supply and demand managements. The focus is on matching the supply plans with demand plans. (Lapide 2007b.)

It may be stated that the forecast meetings may be considered as more of an operative guide to the case company's business than the prepared budgetary forecasts. However, since so far not all sales has been included in the forecast meetings, several sales teams have followed only the sales budgets with their customers. Therefore, the author has reached the conclusion that sales budgets have too large a role in guiding sales operations. Regarding future improvements, the dependence merely on the sales budget should be diminished and uniform forecasting practices covering all sales teams should be implemented. In addition, production and sales will need to learn to speak the same language in order to enhance operations.

6.2.5 Uncertainty in demand supply matching generated from the demand side

Uncertainty of future demand was unanimously regarded as one of the greatest problems in the case company when discussing the uncertainties in demand supply matching from demand side point of view. As stated in literature by several researchers as well (see e.g. Gupta and Maranas 2003; Croxton et al. 2002, 62), in any manufacturing organization the product demand creates the most uncertainty and is the most problematic of all the sources of variability. Among the interviewees, Logistics manager 2 was one to conclude:

> *The greatest challenge we face is particularly demand variability. Some variability is self-inflected and some cause by the markets. Self-inflected demand variability bothers the most and is the hardest to accept. But that is the type of demand variability that we would most want to reduce. Variability caused by the markets just needs to be accepted.*
> (Logistics manager 2)

From production's point of view, Production manager 2 concluded that demand uncertainty creates more challenges for MTO production lines than the MTS production line. The respondent explained that since this production line is the only one manufacturing according to MTS principle, the challenges faced are somewhat different. They are related more to being able to manufacture certain volume profitably rather than demand variability. In this production line, demand variability may be evened out with buffers in stock. Logistics manager 2 commented as well that keeping safety buffers is regarded as one means to prepare for demand changes. Within this product line, only with low-demand products, uncertainty in demand may cause challenges. Sales manager 4 agreed completely on this matter. Since he is a member of sales team 4, their customer base purchases these MTS manufactured products. He commented that regarding these products, there is no noticeable demand uncertainty as they are MTS manufactured.

Relating to experienced demand uncertainty, Logistics managers 1 and 2, among others, were strongly of the opinion that all *the sister factories* and other *large customers*, which usually are *OEM customers*, cause the most turbulence for sales department. Production director emphasized that uncertainty and turbulence with the sisters, however, is self-inflected. The most important issue with them is to realize that when they inflict problems, it is simply a consequence of not a good enough cooperation with them. Logistics manager 1 commented to this issue further:

> *If we began thinking what is the easiest to control or is in our own hands, then it would most certainly be the sisters. Therefore, the focus should first be on the*

> *sisters so that they could be controlled in a reasonable way. However, we have already taken some steps forward concerning the cooperation with our sisters. But when truly effective ways to work with the sisters can be found, these ways could be copied also to the OEM relationships and see how they work with these customers.*
> (Logistics manager 1)

Sales manager 2 contemplated as well that since business with the sisters is internal trade, it would only be reasonable if some improvements to business with them could be found. Logistics manager 1 explained that the sister factories cause problems with their purchasing behavior. They may have their own motives, of which the case company is not aware, why they decide to start increasing or decreasing their stock. One reason for not communicating these motives with the case company might be the fact that they simply do not wish to share them. In addition, each sister factory operates more or less as a separate unit and answers to their own country organization where there have their own rules. Therefore, in each country the sisters operate according to the principles that matter to them. Logistics manager 1 concluded:

> *The smartest and most transparent way of handling things would be to coordinate operations in such a way that business would be handled in similar ways in each organization within the BU. This would eliminate cultural or other turbulence causing factors.*
> (Logistics manager 1)

Among many others, Logistics manager 2 explained that it would be important to level the material flow between sister factories. The sister factories order most of the time infrequently and in large amounts, when they should be ordering more frequently and in smaller amounts. The respondent continued that in the operations between the sister factories rules and processes could be completely different in nature. The normal ordering process is not necessarily even suitable to be used with the sisters. Instead, the ordering process could be planned to be entirely unique. Because, after all, when dealing with a company's sister factories, it should be possible to look at the wholeness and agree on issues such as leveling the material flow. Sales manager 1 was of the opinion that there should be some type of limit in the systems for the sister factories, when they place orders. Since it creates challenges when especially one of the sister factories orders an immense amount of products and this order goes automatically through to production. As a result, all capacity is being worn out. Thus, other customers suffer due to long lead times. The interviewee explained his view as follows:

> *It is better to not place any limits to large customers, but our sister factories should be better controlled. Perhaps the placed limit could be according to the accuracy of the forecast they provide us with.*
> (Sales manager 1)

Production director, as well as several other interviewees, concluded *large projects* from OEM customers to be extremely problematic. There is never certain knowledge whether a project will materialize or not. OEMs that manufacture in constant series are often the most capable in providing the case company with their demand forecasts. Despite the fact that they might be extremely demanding customers, they are able to forecast their future demand needs. Thus, they should be the easiest for the case company to control. Sales manager 2 concluded as follows:

> *With OEM customers it is only the matter of building the relationship into such a good one that they provide us with information about their future orders as beforehand as possible. The only issue is that this takes time.*
> (Sales manager 2)

From Sales manager 4 point of view, the real challenge with all OEM customers is the operations model used with them. The interviewee continued that the problematic issue starts from having far too many intermediaries in the chain between the OEM customer and the case company. In the chain, there is the case company, the certain country sales organization and additionally a distributor might be involved. As each of the chain members wants their own shares of the profits, the prices lose their competitive status. However, even though many problems with the sisters and OEM customers occur, they are crucial customers to the case company's business. Production manager 1 commented as thus:

> *Our delivery reliability needs to be at its best with these two clienteles. If we are not able to fulfill their delivery requirements, they will change suppliers. Particularly OEMs are challenging for us since they have such high criteria concerning delivery times.*
> (Production manager 1)

Naturally, OEM customer projects and sister factories are not the only sources of uncertainty from the demand side when trying to successfully match demand with supply in the case company. Logistics manager 2 was concerned about the fact that even though the case company tries to be very dynamic and flexible, in reality the reaction times are extremely long. Even three to four months may pass until the demand situa-

tion is concretely communicated to suppliers. It is not an issue of not being capable of reacting, but rather it is a matter of caution. However, the Logistics manager 2 concluded that this cautious way of proceeding is somewhat logical since the economic situation is unstable and history guides decision making. This leads to the same conclusion as with demand forecasting; historical information should not be the only basis for the future. Sales managers 2 and 4 were of the opinion that one major challenge is whether the sales manager receives the needed information from the customer. Sales manager 2 explained his view:

> *The deeper and more long-term the relationship with the customer is, it always helps the situation. Because then we know one another already so well that we can learn to know the correct contacts and receive beforehand much information about the future from them. However, the building of such relationship is a long-lasting project.*
> (Sales manager 2)

Sales manager 4 continued that certain customers simply might not know their future needs themselves either, or then there are other influencing factors why information is not shared. Further, one extremely challenging issue arose from the interview with Sales manager 3. Namely, the interviewee concluded that the demand forecast figures received from the customers are not necessarily that reliable. At least in respondent's sales region a big problem is the reliability of basic data. To conclude, Logistics manager 1 had good insight concerning perhaps the main issue behind several of the case company's current problems: information sharing within the case company and with external partners. The interviewee commented as follows:

> *There are always risks in the marketplace, for instance Europe's current state, that none of us can affect. After all, our products are investment goods and therefore are greatly influenced by world economic conditions. But the biggest issue we need to work on is information sharing between different parties and that there is an organized way to conduct operations. Information sharing is so difficult that it can be stumbled on at so many points.*
> (Logistics manager 1)

A company's information flow and how it is being organized has major impact on all operations. This fact has been widely agreed upon and therefore, requires special attention. Helms et al. (2000, 393), for example, state that in collaborative forecasting, issues of complexity are overcome by information sharing. In addition, Croxton et al. (2002, 56) explain in their DM model that planning the information flow is considered to be

one strategic component of efficient DM. Therefore, information sharing has proven to have enormous effect on demand supply matching activities.

6.3 Findings from the comparison with one customer organization

The customer organization is a global high technology company which has operations in approximately 60 countries. The company's product portfolio consists of various product groups. Similarly to most production lines in the case company, this organization manufactures according to MTO strategy as well. The lead times for their products, however, are substantially longer than for the case company's products. Namely, the shortest time of delivery for certain standard products is approximately four weeks and it may be as long as one year for some products. An important issue to be emphasized about the customer organization is the fact that their operations are led by processes. Processes, that are continuously being developed, lead every operation. And since the customer organization is a global actor in its industry, most processes are developed and maintained globally. (Demand manager in the customer organization.)

The Demand manager explained that in general, the planning processes in the customer organization are divided into *three time intervals*. Firstly, long-term horizon covers an understanding of the business over a time period of 16-36 months. The organization tries to understand the world as far as a range of three years. Secondly, medium-term planning horizon contains understanding of the business within 4-15 months. Thirdly, short-term horizon covers a time period starting from current date up to 4 months. Each time horizon has different goals and enables different type of decision making. The time horizons complete one another as they are integrated. This categorization of planning horizons is widely acknowledged in literature (see e.g. Fleischmann et al. 2002, 72). Demand planning is considered as *a support mechanism* for the rest of the business, but an extremely important one since it enables the optimal usage of resources. Salesmen play a central role in especially medium-term demand planning since they communicate with customers and are the key persons when making contracts with them. In fact, the responsibility of the sales force is to *sell and create close relationships* with customers. It is not to constantly insert data into the ERP system concerning the customer relationships. This indicates that even though sales department owns a major part of demand planning, they need support and incentives to make the process successful. The Demand manager described a tool to increase sales' commitment and input to demand planning.

> *When a salesman gives his assessment of the delivery date for an order, this date can always be compared to the real delivery date. In such way, we can evaluate*

> *how accurately the salesman was able to predict the delivery schedule when making the contract and how good a contract he in fact made. These evaluations may then be tied to the salesman's performance.*
> (Demand manager in the customer organization)

Further, salesmen need to *update and maintain the contracts*. The Demand manager explained about a process within the customer organization that aims in capturing the customer:

> *The salesman follows the development of the customer relationship all the time as it moves closer and closer to the actual contract. This way salesmen create an understanding about which of the customer leads that have not yet led to a contract are even possible. Consequently, sales department is in central position in determining what future demand will be.*
> (Demand manager in the customer organization)

Then again, an important part of the responsibility for sales personnel in this organization is *to bring in new customer leads*. The interviewee concluded that if there would be no processes or systems on how to bring in these leads, many difficulties would arise, especially when the environment in question is global. Certain structure, with special "landmarks", should be in place. A landmark refers to, for instance, a situation when the salesperson has gotten one step closer in establishing a stable relationship with the customer. When this step has been passed, the salesman may update into the system that this specific relationship has advanced further. In addition, all salesmen carry one further critical responsibility. When meeting with the customer, they sell not only the product but *the delivery process* as well. Through this mind set, they can assure customer satisfaction as well as good internal understanding. (Demand manager in the customer organization.)

> *The salesman informs the customer already when meeting them that a vital part of fluent delivery and mutual satisfaction is that you as our customer are able to inform us your timetable as accurately as possible. The customer should be informed that we are extremely efficient with delivering requested products and we ask you only one thing in return; to know how your project is proceeding at regular intervals.*
> (Demand manager in the customer organization)

The interviewee stated that their *forecasting process* is under continuous development. The present process produces quite accurate information to many time horizons

already, even though many challenges exist. The company is aware that they have a lot of work still ahead. From this point of view, the Demand manager concluded that they are never fully satisfied. The interviewee described their current demand forecasting process as follows:

> *In demand forecasting, there are different levels and people involved. For instance, in our sales company in Finland the operative and sales manager take part in demand forecasting process and collect the data from their systems. From the collected data they prepare a demand estimate for a certain time horizon. They also prepare a monthly demand for certain products. In addition, we have a person specialized in demand planning to assist in the process. In each country where we operate we have at least one of such demand planners. The demand planner helps the operative- and sales managers, consolidates information and supports in the creation of the forecast numbers.*
> (Demand manager in the customer organization)

A major advantage of the forecasting process is that it is designed to be flexible. Flexibility is required in situations when it is necessary to prepare more than one plan and react rapidly. For instance, in the short-term planning cycle the company might review their demand every week. In the customer company, the demand is gathered by following *a data collecting process*. Since there are operations in several countries, there are many areas of business. The demand data is collected separately in each business area by the operative and sales managers located in this business area. In addition, the demand planner is there to assist these persons. The starting point is always predicting the future which is substantially more difficult than forecasting the past. The collection of the demand data is done by looking at the area's 1) order book, 2) tender book and 3) possibly other affecting factors. From these data sources the actual plan for demand is created. Occasionally, within a stable market area, historical data may provide one source of information as well. The order book contains still open but confirmed customer orders whereas the tender book contains possible but not confirmed orders. Once all business areas have created their demand, the information is consolidated to one place. This way a structure of required products in all business areas is formed. (Demand manager in the customer organization.) It must be pointed out, that in the case company it is production personnel who follow the order book. In addition, Production director explained that the order book in the case company is extremely short whereas at the customer organization it is considered to be long.

The Demand manager stated that when preparing forecasts, *no commercial planning program* is being used; SAP and Excel are the applied tools. The interviewee was of the opinion that in principle, planning tools are expensive and their maintenance is costly.

Naturally they possess other features, but less expensive calculators, such as Excel from Microsoft, are available. The demand planning process in the customer organization exploits *numerous metrics*, once again depending on the time horizon. For example, in the medium-term planning horizon the difference between actual sales versus forecasted sales is being measured. In addition, the company has country specific, area specific, factory specific and production line specific accuracy metrics. These metrics are looked into always when the demand data is being collected and decisions concerning demand are being made. They serve as a benchmark for the process development as well as provide insight about how real demand actually is and how demand actualized.

The role of product management at the customer organization is to show what kind of characteristics the organization's products have globally. In other words, they need to examine what makes the products competitive. Product management provides instructions to sales department about what products to sell and promote. If some specific product is regarded as highly competitive and brings more revenue, the sales personnel is informed that this product is more worthwhile to sell instead of an older and less profitable product. Moreover, the customer organization has a separate department for operations concentrating on *business intelligence*. Continuous research is being carried out; however, large planning rounds are made globally only a few times per year. The information this department produces gives insight regarding what happens in the business environment and indicators of economic development over long-term. The interviewee was of the opinion that such data is important to gather. Otherwise, organizations must have a complete understanding about competitors' strengths in each market area as well as own strengths and weaknesses.

The company's *controllers* participate currently only partly in planning demand. The interviewee, however, stated that their participation is meant to be increased. The controllers would provide their expertise when linking sales volumes with financial targets. Furthermore, *suppliers* are not a part of this organization's demand planning process. However, connecting them into the process is being actively planned. (Demand manager in the customer organization.) To summarize, below Table 6 presents the main conclusions discovered through comparing the case company with the customer organization.

Table 6 Conclusions from customer organization comparison

Present state in customer organization	Comparison with present state in the case company
1) Concept of demand planning process • demand forecasting is understood to be a *different* concept • a systematic approach	**1) Concept of demand planning process** • demand forecasting is considered to be a *synonymous* concept • a systematic approach is being developed
2) Tasks & role of salesmen • carry *a large responsibility* for demand planning • to sell and create close customer relationships → they sell not only the product but the delivery process as well • a structure for updating customer relationship status *exists*	**2) Tasks & role of salesmen** • carry *little responsibility* for demand planning • to sell and create close customer relationships • a structure for updating customer relationship/project status *does not exist*
3) Demand forecasting process • *systematic* data collecting and measurement • forecasting relies on *future* • no additional commercial software is being used	**3) Demand forecasting process** • systematic data collecting and measurement *are being developed* • forecasting relies heavily on *history* • no additional commercial software is being used
4) Demand planner • *major role* in demand planning	**4) Demand planner** • *non-existent role*
5) Product management • examines what makes the products competitive → such information is *shared* with sales	**5) Product management** • examines what makes the products competitive → information is *minimally shared* with sales
6) Business intelligence data • is being *comprehensively* exploited	**6) Business intelligence data** • is being *minimally* exploited
7) Controller • participates *partly*	**7) Controller** • participates *minimally*
8) Participation of suppliers • non-existent, however at active planning stage	**8) Participation of suppliers** • non-existent; planning should start after demand planning has started to improve internally

6.4 Improvement suggestions for a more efficient demand planning process in the case company

6.4.1 New conception of demand planning

This chapter provides answers to the second specifying research question: *How can the demand planning process be improved in order for the case company to achieve a more accurate demand plan?* To begin with, it needs to be emphasized that the most challenging, yet perhaps most important, customers for the case company are sister factories and project OEM customers. In the empirical research certain guidelines for improvement concerning these two clienteles were discovered and they were presented in Chapter 6.2.5. This entire Chapter 6.4 aims providing general guidelines through which demand planning regarding the sisters, OEMs and all other customers may be advanced. Further, it must be stated that based on findings from literature and empirical research, no significant differences between demand planning processes in MTO and MTS environments were found. Only one striking difference was identified, namely in MTO environment demand uncertainty is considered to create more challenges than in MTS environment. Thus, MTO environment requires even more careful demand planning than MTS. And since most production lines in the case company use MTO strategy, demand planning needs to be considered as a critical business process. In the case company, there are high expectations regarding the SOP project. It is seen as a challenging and a necessary step to improved operations. As Production manager 2 indicated, SOP will surely bring improvements to the case company's operations. The interviewee was convinced that from now on, sales will be able to give more accurate information about upcoming demand.

To ultimately start changing the current conception of demand planning towards a more advanced and holistic one, the author suggests the case company to first *start improving their demand planning process from the inside* and simultaneously *increase customers' involvement*. As Crum and Palmatier (2003, 2) state, many organizations view their internal integration as a prerequisite for being an effective trading partner in a supply chain. The researchers have discovered that successful collaboration starts with effective internal DM activities. Thus, the case company should concentrate on training the subject area of demand planning to people participating in the process. Since currently, the mindset for demand planning is incorrect. This is due to the fact that production has been the responsible function when forecasting demand and no true demand planning process has existed. In brief, the logic in demand planning needs to be trained. It should be emphasized that there is a difference between planning and forecasting demand. Further, the output in the form of one single demand plan should cover a time

horizon of 1-18 months. In addition, future sales predictions need to be presented not only in Euros, but in units as well. Among the interviewees, for instance Production manager 1 and Sales manager 3 saw this as one critical improvement to the process of demand planning.

Further, since some customers already are involved in the process by providing their demand forecasts, it would be only reasonable to increase their participation even more. Including key suppliers into the process is a step the case company should take only then when demand planning is well established. That being said, the case company needs to keep in mind that involving key suppliers into their demand planning will substantially improve the process further. Therefore, the sooner demand planning is established well within the case company and key suppliers become involved in it, the better results may be achieved. Customers' involvement may be increased by encouraging more customers to provide their true and reliable estimates regarding future demand. In addition, when available, knowledge about channel customers' inventory data is considered to be useful as well (see e.g. Kaipia et al. 2006, 111). In order to increase customer participation, salesmen need to try and get closer to their customers. Logistics manager 1 commented that it would be extremely important to try and get close to OEM customers particularly. This way insight about their way of operating and how they, for instance, handle their SOP processes could be better received. Building trust takes time, but nevertheless, it is worth the effort. Getting customers to trust the case company will most certainly facilitate the company's short-term, medium-term and long-term planning. Sales manager 2 commented as follows:

> *With this new process, sales managers need to study their customers perhaps more often and try to predict how much they order. They need to know where the relationship is going instead of following the yearly budget which has been the current way with KAMs.*
> (Sales manager 2)

A second new conception regarding demand planning is to *increase feedback and provide incentives.* Hellriegel (2009, 15), among other researchers, suggests especially feedback to be a key issue in improving a company's demand planning process. Giving and receiving feedback from trading partners and people within a company are both considered to bring improvements in demand planning. Feedback promotes motivation and learning, which are important elements especially in such a difficult process as demand planning. Giving positive feedback is a simple encouragement method and it gives people an incentive to continue performing well. Negative feedback is also useful; it creates an opportunity to learn from mistakes. In demand planning, especially important is committing the sales managers into the process since their first responsibility

should be to sell and be at the customer interface; not preparing reports and typing information into databases. The importance of proper incentives was also agreed by Sales manager 1:

> *Sales managers may become more committed to demand planning when they consider the process to be important. Perhaps certain follow-ups or something else might help in "selling" the process to the salesmen. Also small prizes once in a while are good to offer. All in all, there needs to be some incentives, so that the process does not bring only additional reporting.*
> (Sales manager 1)

Similarly, Production director stated that the demand planning process should be rewarding in such a way that sales managers see their contributions are useful. Literature supports this idea as well. Namely, when the demand side in the company sees that its inputs are useful and consider the demand plan as a request for products, they might become more active in providing input to the demand plan. They also see better the process value when they realize that their efforts are helping to make product available to customers when promised. Moreover, demonstrating that the plan has been put a lot of effort in is crucial in trying to get the supply and finance functions trust the plan. (Crum & Palmatier 2003, 37.) The Demand manager in the customer organization described their tool to increase sales' commitment and input to demand planning:

> *When a salesman gives his assessment of the delivery date for an order, this date can always be compared to the real delivery date. In such way, we can evaluate how accurately the salesman was able to predict the delivery schedule when making the contract and how good a contract he in fact made. These evaluations may then be tied to the salesman's performance.*
> (Demand manager in the customer organization)

This type of commitment method would not as such work in the case company, since orders are mostly confirmed automatically or through sales administrators without the sales manager ever knowing about them. However, the underlying idea in this method could be taken into usage in the case company. Namely, the accuracy of each sales manager's prepared demand plan could be compared to the actual demand once it is realized. Helms et al. (2000, 400) support such an idea and state that even some types of bonuses can be given as an incentive regarding the accuracy of the demand plan. One idea could be to tie the sales managers' accuracy in preparing the demand plans to a yearly bonus.

A third new conception of demand planning relates to *collecting and sharing demand information*. Firstly, demand plans should be based on *more information sources than merely historical demand data*. As Logistics manager 2 concluded that using only historical demand data is the main problem in the case company's current forecasting process. It is a common opinion among researchers that especially during such ever changing economic times, relying merely on historical demand information may not be the best way to predict future demand (see e.g. Lapide 2009). Only in an environment where demand is stable and few changes are to be expected, the forecast based on history may be the most accurate input into demand planning (Crum & Palmatier 2003, 32). However, the current economic situation is anything but stable. Therefore, the author urges the case company to start using other demand data sources besides historical sales information. Langabeer (2000, 70) also comments that a more strategic approach would be to use all available market data and intelligence for demand analyses. The case company's demand planning process should start developing towards a collaborative forecasting process, in which according to Helms et al. (2000) the traditional, historical based forecasting approach is supplemented with information gathered from customers, the marketplace and other important departments.

Secondly, in addition to shifting the focus away from historical data, a common wish among interviewees regarding future operations was the need for *more systematic and organized demand information collecting and sharing*. Production director stated that a systematic process and discipline for collecting demand data needs to be developed since the collected demand data serves as the basis for determining the level of future demand. However, as sales managers are the ones to take main responsibility for demand planning, it needs to be kept in mind that their main function should continue to be selling and building customer relationships. Therefore, the data collecting process must stay light and meaningful. It is a commonly known fact that all the case company's customers are not able to provide any demand forecasts. And when they are, some of these forecasts are considered to be unreliable. Such forecasts should not be used as the basis for creating a demand plan. As Croxton et al. (2002, 55) also state, sales teams needs to understand the value of each information source. For example, they should determine how good each source truly is at predicting demand. Further, even when customer relationships are put more emphasis on in the future and customers' participation is meant to be increased, the possibility for receiving reliable forecasts from each customer is non-existent. Therefore, each sales manager needs to understand a demand forecast is not enough, but it needs to be supplemented with more information. As Production director implied, in addition to demand forecast, it would be necessary to include other information sources into demand planning:

> *Within our company, there are other vital sources of information, such as different offer and quotation databases, project lists and so on. In addition, a valuable competency is the ability to interpret and exploit market research studies.*
> (Production director)

In addition, Logistics manager 1 concluded that it would be important to get closer to POS data, so that there would not be so many people in between filtering the sales information. In demand planning, POS data is most widely used by using historical POS data as a reference (e.g. Gallucci and McCarthy 2009, 12). All in all, downstream demand data, such as POS data and channel customers' inventory data, is considered to be extremely useful information. An increasing visibility of the end-customer demand improves the performance in the demand supply network. The difficulty mostly is in choosing the right information and using this information intelligently. (Kaipia et al. 2006, 111.) However, in the case company's industry real POS data is extremely difficult to obtain. And as POS data is mostly used as a historical reference, the case company needs to be aiming to the direction of not using historical information as the main source for predicting demand. As the Demand manager from the customer organization also concluded, demand planning needs to rely on estimates of the future, not the past. Nevertheless, when historical sales data is being used as one source when forming the demand plans, the best benefit from such data may be achieved when using as unconstrained sales data as possible retrieved from SAP. As Sales manager 5 explained, collecting accurately historical sales data is extremely important.

In the case of *demand data collecting* the author suggests the case company to try and learn from multiple sources of evidence: literature, the comments received from the case company's interviewees and the customer organization to some extent. As the Demand manager from the customer organization explained, their demand data is collected from the following sources: order book, tender book and other external factors. However, in the case company's situation, the order book is short. Therefore, it is impossible for sales managers to exploit the order book when planning demand. Offers to customers are prepared often in the case company and there are a few databases where the offers are being stored. However, sales managers hardly ever receive the information, whether the customer placed the order according to the offer or not. Sales manager 1 considered this issue to be somewhat troublesome. The interviewee was of the opinion that, for example, when a sales manager makes an extensive offer, it could be rewarding for the manager to know if the order was placed or not. He suggested that perhaps with a monthly follow-up of all significant offers made, the status of these offers could be found out. Relating to the same issue, Logistics manager 1 commented that it would be of great value when especially the managers of sales team 1 could prepare some sort of list concerning significant offers they have recently made to customers and what the

status of these offers is at the moment. When such a monthly, or even weekly, follow-up for significant offers could be developed, the database could provide one additional source for the creation of demand plans. In addition, it would serve as an incentive for the sales managers.

Further, a common opinion among interviewees was that there should be a procedure through which customers could provide advance indications and warnings when substantially large orders are being expected. Sales manager 3 concluded that without any established structure, this would not work. Production personnel would benefit from such information the most, since they are dependent on the information sales is able to provide them. Therefore, the author urges the case company to develop *a database for project status follow-up*. In fact, Sales manager 5 explained about a tool currently being developed. The purpose of this tool is to try and get all countries to place their large projects into the database. The interviewee, however, concluded that at the moment this tool is very difficult to use. Thus, the author suggests the following: either to improve this tool or create a completely new one. The tool should contain information about possible upcoming large projects placed there either by the customer or the sales manager. In addition, the status of these large projects should be placed there by the sales manager.

In the case of *demand data sharing*, Logistics manager 1 commented that it would be beneficial when all demand data could be available to all online. In addition, Logistics manager 2 emphasized the importance of developing such processes that would enable the case company to share, for example, demand information between all participants within the case company's supply chain. Crum and Palmatier (2003, 4) conclude that due to great advances in information technology, demand information may be communicated at increasing speeds throughout the entire supply chain. Likewise, Stadtler (2005, 578) explain that new opportunities of advanced information and communication technology allow for rapid information exchange between partners via Internet and related services. Therefore, for example forecasts and sales data is possible to be exchanged across the supply chain swiftly and at low cost. The author suggests that the final demand plan created in the demand planning meeting would be shared through the case company Intranet. This enables the possibility for all interested to investigate the planned demand figures. As Croxton et al. (2002, 56) state, it is important to make sure the demand plans are communicated to people that are affected by them. Thus, this would be made possible when placing the demand plan into the Intranet.

6.4.2 Participating functions in demand planning

Once SOP has been implemented into the case company, the present forecast meeting will be broken down into smaller and more focused meetings. Demand planning meeting, or a demand review, will be the first step within SOP. It concentrates on achieving a unanimous decision resulting in a demand plan; a complete vision of the future from sales department that is used as a driver for other operations, for instance supply plans. As the demand plan should be based on inputs received from different functions, it is vital that a single demand plan can be agreed upon. Nevertheless, quite often the demand plan is prepared only with the input from one powerful group. (Hellriegel 2009, 14.) Therefore, it needs to be made sure that even though sales and a demand planner will be responsible for creating the demand plan, *other departments in the case company provide support* in this process by providing the necessary information. In order for demand planning to be efficient, sales and other related functions need to understand their role in creating the demand plan. Further, contrary to current state, production becomes part of SOP only once the demand plan is agreed upon and the demand side of operations has fulfilled its duty. In addition, sales function needs to realize that they are the key persons in the process and all sales teams are important. Sales manager 1 was very distinctively of the opinion that the main challenge is how the case company can handle the largest and most surprising situations that often come from OEM customers.

> *I want of course comments also from KAMs. They know best what causes large demand peaks and in order to know these in advance, we simply must get closer to the OEM customers.*
> (Sales manager 1)

The below Figure 12 depicts the sequence of functions which should contribute to demand planning in the case company. The outcome is dependent on how well all functions are able to bring their contribution.

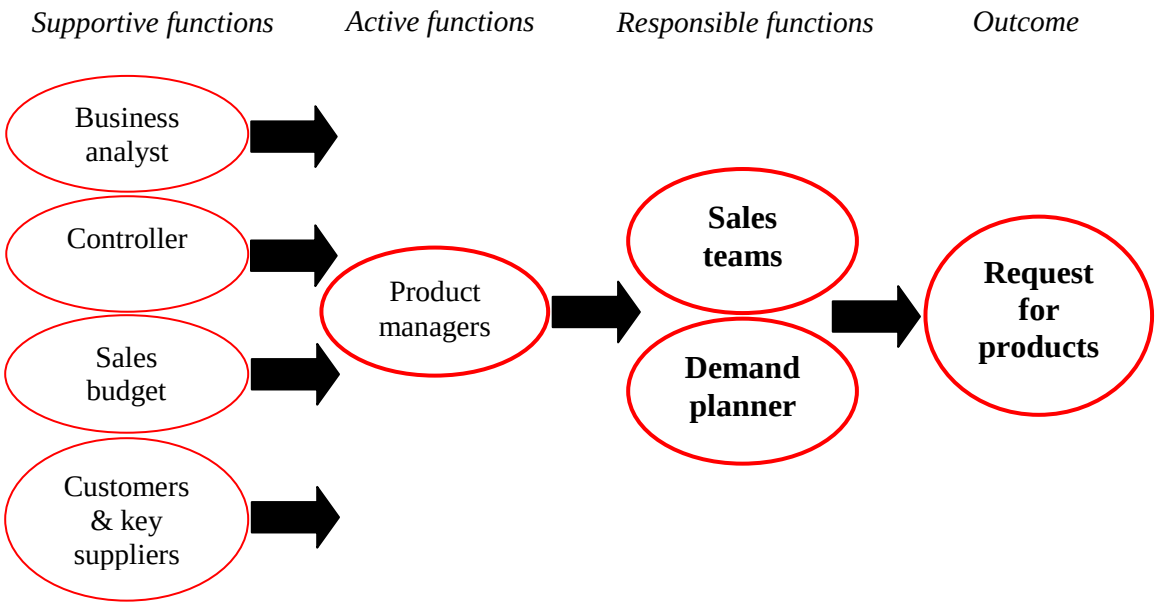

Figure 12 Functions in demand planning

The aim when starting to improve the case company's demand planning is to design a new process that is more uniform and consistent than previous processes. The responsible functions are all case company's sales teams and a demand planner. There can even be more than one demand planner, if needed. Contrary to current situation where sales team 1 has taken on the role of being the only one to bring contribution to forecast meetings, *every sales team* is ideally expected to participate in planning demand. Similarly to what Production director concluded, the author suggests that since each sales team handles different areas and partly different customers, each sales team provides the information they know best. However, the structure of the case company sales department causes slight difficulties in being able to get all teams to participate equally much and prepare their demand plans in similar way. Therefore, this phase may only be described as *the most challenging* one with the demand planning process.

The demand planning meeting takes place each month. Therefore, sales managers need to prepare their demand plans every month; not every quarter as has been done until now. Crum and Palmatier (2003, 1) also agree that the demand plan is updated every month rather than every quarter. Therefore, monthly forecast information is required. *Sales team 1* plans the demand for their areas' basic business and do not include OEM customers into their plans. Planning demand for OEM customers is the responsibility of *sales team 2*. Sales team 1 needs to be careful not to include OEM customers into their plans, as they have previously done. Otherwise these customers may be included into the final demand plan twice. *Sales team 3* carries responsibility for their regions and each regional manager has a few area managers answering to them. Ideally, each regional sales team leader should be considered to participate in the demand plan-

ning meetings. Sales manager 3 from sales team 3 explained that their customers prepare yearly forecasts and the sales managers, or at least this sales manager, prepare demand forecasts and review them monthly. Their efforts should be exploited by including the team leaders to the demand planning meetings. Business from *sales team 4* is included in sales team 1 sales. Therefore, there is no need for them to participate in the demand planning meetings. Nevertheless, these sales managers should follow their customers as closely as possible and prepare estimates for future demand; every sales team in the case company is expected to participate in demand planning. This will be a major change for the team, since until now they have only prepared yearly budgets with their customers.

Basic business from *sales team 5* is already included into the demand plans prepared by sales team 1 as well. However, since these sales managers already prepare yearly the demand plans, or forecasts, for their market areas and then review them every quarter, it would be somewhat a waste if these were not being used at all. In addition, sales managers in sales team 5 are the key persons to report when certain projects or other unexpected events occur within their market areas. As a conclusion, the author suggests the following: these sales managers follow their markets closely and prepare their demand plans. Only then when they know the case company might receive certain large projects from this particular market area, they need to participate in the demand planning meeting and make sure this information is included into the final demand plan covering all sales. In addition, it was found out that the interviewed Sales manager 5 is responsible for an OEM customer within the market. Such customers need to definitely be included in the final demand plan. Therefore, the estimated demand figures for these customers need to be presented by the responsible sales manager in the demand planning meeting. Special attention must be given, once again, in order to make sure such OEMs are not included into KAM team demand plans. To briefly conclude, even if the purpose is to get all sales teams to participate, sales team 1 and 2 are the ones who most certainly will carry the main responsibility from the case company's sales department in demand planning.

The case company's first *demand planner* to be may be considered as the key person who holds the entire process together. This person oversees the forming of each sales managers' individual demand plan, gives support when needed and sees to that all possible information sources are being exploited. In the demand planning meeting the demand planner makes sure a unanimous and single demand plan is formed and writes down all important assumptions the demand plan is based upon. After the meeting, the demand planner makes sure the plan is being communicated to the right people or should it be placed in the Intranet. Additionally, this person tries constantly to identify possible process inefficiencies. Forecast accuracy measurement would belong to de-

mand planner's role as well. In addition, the demand planner may assist senior management in their decision making concerning future demand.

Product management needs to adapt the role of an active function when planning demand. Active role refers to extensive participation but does not require leadership of the process. Product managers have information that would benefit sales in forming the demand plan, namely market intelligence information in the form of competitor analyses. Currently, product management prepares these analyses for product development purposes. When they have been cooperating with sales, it has mainly been related to technical qualities of a certain product. The author suggests substantially increasing the participation of product management in the case company's demand planning process. It is essential to start changing the attitude and mindset of product management towards demand planning. Since now, according to the interviewed Product manager, they need not to be involved in the process at all. In addition, cooperation between product management and sales needs to be increased. The information concerning competitors may be shared with sales simply either in a meeting or through a report.

The role of *business analyst*, or in other words *the market intelligence function*, will be of supportive nature. Currently, such information is minimally being exploited when planning demand. Further, there seems to be a slight mismatch situation since the business analyst prepares market analyses in the hope that they find their way to the correct people. Nevertheless, apart from market managers, no sales manager uses them. Hence, the author suggests the following actions to be taken. Cooperation between sales and the business analyst needs to be increased. Sales managers, or perhaps even all demand planning participants, must be better informed and trained about market research usage possibilities and where to find this information. Production director implied as well that in order to improve the usage of such information, a starting point should be to inform the case company's personnel about what kind of market research is at hand, what types of reports are being prepared and where they can be retrieved. Additionally, in order to improve the usage of this type of information, the business analyst should simply be told what kind of data would be beneficial to sales and in what form the data should be represented. Demand planner could be the person to coordinate this information exchange between sales and the business analyst.

Despite the objection from some sales managers against the usefulness of market research analyses, a widely acknowledged fact is that such data only advances the demand planning process. Langabeer (2000, 67–68) states that the market transmits demand signals to which a company is expected to respond. These demand signals are a way for the market to represent its wants and needs, for instance if prices are too high or new products are wanted. One channel through which these demand signals are transmitted is market research. These signals assist managers formulate strategic responses to the demand planning decisions they are facing. In addition, Fisher, Hammond, Obermeyer

and Raman (1997, 218) conclude that market intelligence may be improved by collecting more data related to demand or by utilizing already available information more effectively. Careful examination of demand information might reveal patterns that would not otherwise present themselves. Thus, the case company may start using the already existing market research analyses more extensively or other possibilities may be looked into.

Controller's role in demand planning is best described by Chase's (2009, 40) explanation. Chase states that role of financing is of supportive nature; finance assesses the revenue implications of sales and marketing activities. In addition, a controller may provide their expertise in risk management and when linking sales volumes with financial targets. Risk management becomes relevant if it comes to a situation where it is not financially feasible to meet all the demand and thus management needs to decide how to allocate resources most effectively (Croxton et al. 2002, 62). *Sales budget* needs to be understood as a basis or a target; not the guideline for operations. Crum and Palmatier (2003, 39–40) explain that thinking of the demand plan as the request for product helps managers and executives resist the urge to make the demand plan match the sales budget and business plan. Since these are, after all, only targets. However, when it is noticed there to be a wide gap between the demand plan and sales budget, it should trigger action to narrow this gap. Lastly, participation of *customers and key suppliers* is vital to further advance the case company's demand planning process. Nevertheless, the author suggested first to include the customers. Only then, when the case company's internal process is being well established, it is reasonable to start including key suppliers into the process. To briefly summarize, the monthly demand planning meeting should consist of the following group of people: team leaders from sales teams 1, 2 and 3, demand planner, sales managers from sales team 5 only when necessary and other demand planning participants may involve themselves if they wish. The foremost important thing is to make sure all functions do provide the input that is required of them.

6.4.3 Advancing demand forecasting practices

In an ideal situation, demand forecasting is considered as only a part of planning demand. Naturally, forecasting demand will maintain its major role when planning demand, but as already indicated, other information sources than a pure forecast need to be exploited as well. Until this date, forecasting demand in the case company has been something that has taken place on several different levels and places. An overall picture has been lacking. Therefore, it is vital that the case company forms *a uniform forecasting process* and truly *concentrates on the process*. Foster (2008, 2–3) explains that there are numerous software tools and solutions that can provide the needed demand infor-

mation for the creation of a forecast. However, the forecasting process itself contains much more than learning about new forecasting models and software tools. Production director, among others, wished that the amount of forecasts would be significantly reduced.

> *It would be great if we had a single process that fulfilled the requirements of forecasting from the perspectives of management, suppliers and capacity.*
> (Production director)

It is widely agreed upon in literature (see e.g. Croxton et al. 2002, 55) that a company will most certainly lose control over the forecasting process if managers of each function prepare independently their own forecasts. Further, as SOP is nowadays known as a best practice in the business world, SOP has been proven to unify forecasting practices within companies. In the case company's situation, as there are sister factories that need to be taken into account, an important issue is training the sister factories and implementing SOP into them as well. Langabeer and Stoughton (2001, 7) state that the overall performance of an organization will be maximized if the demand forecasting processes are collaborative and sophisticated. As explained in the previous Chapter 6.4.2, in order to unify the forecasting process in the case company, all sales managers need to participate and create their demand plans for the customers or areas they are responsible for. Similar demand data collection methods should be used and sales managers need to learn not to rely only on the sales budget. Naturally, budgetary forecast will remain as the baseline for demand planning, but will not guide operations for sales teams as it has previously done for some. In addition, customers will gain an even more important role in the case company's demand planning. In an ideal situation, all customers would be able to provide accurate and real time information about their future demand needs. In addition, it is important to realize that different parts of the organization might need different levels of the forecast (Helms et al. 2000, 398). For example, as Sourcing manager and Logistics manager 2 explained, they need information about future demand that is broken down all the way into component level requirements. The demand plan, on the other hand, should present demand figures in product family and frame size level, and both in Euros and units.

In addition to the significance of the forecasting process itself, the author suggests the case company to start using an appropriate *statistical forecasting method*. In addition, the case company might consider purchasing some type of *software* to assist in the forming of demand forecasts. It is a widely acknowledged fact that statistical methods lead to more accurate forecasts. Chase (2009), for instance, is strongly of the opinion that most accurate demand forecasts may be gained by using statistical analysis of demand data. Through such methods, sales trends as well as seasonality in sales could be

more accurately predicted. Further, even though Foster (2008, 2–3) encourages companies to concentrate more on the forecasting process, he explains that there are numerous statistical methods and software tools that can provide the needed demand information for the creation of a forecast. In addition, Chase (1998, 23) argues that an accurate demand forecast is created through combining statistical analysis with a strong business understanding. Even though the Demand manager in the customer organization did not believe in the possible additional value brought by forecasting software, Logistics manager 2 had real confidence in computerized forecasting tools and was convinced acquiring certain software would improve the quality of demand forecasts.

Literature supports widely the measurement of forecast errors. For example, Hellriegel (2009, 15) explains that metrics are meant to point out specific areas in need of improvement. Thus, the author urges the case company to develop a *forecast accuracy measurement system*. Unfortunately, such metrics are mostly not important to companies. However, learning from past mistakes and errors is one vital component in good forecasting. For example, a starting point for improving future forecasts might involve tracing the source of the unexpected demand. It could be, for instance, a particular customer, region or a product. And once the source is identified, it must be determined what the cause was and will the change in demand be long-term or only short-term. (Croxton et al. 2002, 61.) Mentzer et al. (1999, 55) explain that companies need to make sure forecast accuracy is measured at all levels relevant to the departments using the forecast. Moreover, when measuring the performance and advancement of the entire demand planning process, forecast accuracy measurement qualifies for this purpose as well. Namely, since demand forecasts are a part of demand plans, the accuracy of the forecasts affects the entire demand planning process. Hellriegel (2009, 15) explains that when considering metrics to measure demand planning process, the metrics need to be meaningful and connected to the process. Additionally, Croxton et al. (2002, 60) state that a forecast error is a very typical measure for the entire DM process. As demand planning is one element in DM, as a conclusion may be stated that measuring forecast accuracy qualifies for measuring demand planning process performance in total.

A forecast accuracy measurement system was proven to be an extremely desired improvement among the interviewees as well. Until now, production lines have been responsible for measuring forecast accuracy. They have been measuring only the relationship between true sales versus forecasted sales on product level. No country specific forecast accuracy metrics, for instance, have been used. Production director had the following insight regarding this:

> *Now that we try to build entire demand from separate fields, we must build a measurement system to follow our performance. If we keep track of forecast accuracy only on product level, we never get the chance to influence upstream op-*

> *erations. Through a measurement system we may be able to see what kind of demand flows our company receives. This system should include measuring the forecast accuracy of certain OEM customers, of countries and perhaps of market areas.*
> (Production director)

Sourcing manager continued that it would absolutely be beneficial when forecast errors at different levels and areas would be measured. After all, in addition to random errors, there is systematic error as well. Based on supportive evidence from literature, the interviewees in the case company and the Demand manager in the customer organization, the author suggests the following levels to be included when measuring forecast accuracy:

- product line specific, as has been already done
- country specific / certain area specific in sales team 1
- OEM customer specific in sales team 2
- regional accuracy measurement in sales team 3
- market area specific in sales teams 4 and 5
- sister factory specific.

Demand planner would be in charge of the measurement process and he would make sure the results would be communicated to all relevant people. It is important that the metric used to measure forecast errors is relatively simple and with which management is comfortable (Mentzer et al. 1999, 55). The author suggests two possible options for the case company. One metric is simply to measure the actual demand versus forecasted demand, as has been done on product level. Another metric is MAPE; it relates the forecast error to the demand level in a specific time period. (Krajewski et al. 2009, 498.) Chase (2009, 86–87) argues that MAPE is the most commonly used accuracy measure. Since it gives out a percentage, the measure is a relative one and easily understood. The forecast errors should be calculated in units, since it will provide a more accurate and meaningful result than measurement in Euros. MAPE may be calculated by first calculating the absolute value of forecast error in a specific time period divided by the actual demand in that period. This is repeated with each time period. The results are then added up and the sum is divided by the total number of periods used in the calculation. The final result is multiplied by hundred which gives a percentage value of how much the forecast has deviated. (Krajewski et al. 2009, 491, 498.)

7 CONCLUSIONS

7.1 Implications for the case company

When beginning to improve demand planning in the case company in order to achieve a more accurate demand plan, all of who are involved must realize that three elements need to be simultaneously in place. These include *people, processes and tools*. (e.g. LaVoie 2010, 12.) Stitt (2004, 2) emphasizes particularly the importance of synchronizing people from different functions in the process of demand planning. Further, since the case company is operating in a global context and has sister factories, it is vital to implement as unanimous a demand planning process as possible to all sister factories. Through this, cooperation between the sisters will most certainly improve. Based on the empirical findings and the underlying theoretical demand planning framework in Figure 9, the author presents in below Table 7 an implementation plan for the case company regarding most critical areas for improvement.

Table 7 Implementation plan for improving demand planning

Target function	What to advance	How to advance
1) *All involved in demand planning*	• Knowledge on demand planning	• Training people towards a correct mindset by teaching what constitutes demand planning
2) *Sales*	• Sales managers' role in demand planning	• Train and motivate sales managers to realize demand planning is one of their main target functions →demand planning is not a single event but a part of an even larger process
	• Participation from customers	• Each sales manager needs to be closer to the customer and maintain the relationship → need to try getting reliable, unconstrained demand information from more customers
	• Usage of demand data sources	• Sales managers need exploit other sources than historical demand data and forecast from customers, such as market and competitor analyses, the database for project status follow-up, possibly made large offers → these data sources require development and training in usage
3) *Demand planner*	• Create the role of a demand planner	• Train the role to the demand planner
4) *Product management*	• Participation into the process	• Train product management in taking an active role → as competitive analysis is already being extensively made, it should be used in demand planning as well
5) *Business analyst & market intelligence*	• Cooperation with sales	• Increase cooperation between sales and business analyst → inform business analyst of possible requirements for improving the usage of market studies
6) *Controller*	• Participation into the process	• Train controller in taking a supportive role → expertise in risk management and assessing revenue implications of sales ac-

		tivities
7) Sales budget	• Conception on sales budget	• Train sales managers to view sales budget as only a target and basis
8) Demand forecasting	• The process itself	• Forming of a uniform process within sales • Monthly demand forecast information instead of quarterly • Forecasts need to be prepared in money and units → demand and supply sides must find a common language
	• Forecasting methods	• Start investigating proper statistical forecasting method, additionally also certain forecasting software
	• Usage of different demand data sources	• Decrease the amount of historical demand data
	• Forecast accuracy measurement	• Take into usage a forecast accuracy measurement system at all relevant levels
9) Feedback and incentives	• Motivation for demand planning participants	• Increase providing feedback and create incentives for especially sales managers, e.g. a yearly bonus tied to accuracy of created demand plans
10) Key suppliers	• Participation into the process once internal process is in place	• Start investigating possibilities to include key suppliers into the process

As beginning to advance the case company's demand planning process, the first and foremost important issue is *training all people involved in the process*. People in the case company do not understand well what constitutes demand planning since until now demand planning is considered to be equal to demand forecasting. In addition, it would be beneficial to introduce the concepts of DM, SOP and even supply chain planning correctly as well. In order for people to understand what demand planning is, they need to first realize the larger context and understand that true DM consists of much more than merely demand planning or SOP. LaVoie (2010, 12) emphasizes the understanding of the broader perspective as well since too often, demand planning and forecasting are used interchangeably. As Mentzer and Moon (2004, 42) explain, every time any kind of plan is being developed, a forecast should be made before it to support the plan. Although the underlying idea in demand planning is generally understood in the case com-

pany, more thorough training is crucial in order for the new approach to be well implemented. Literature supports this conclusion as well, namely Rego (2011, 35), for instance, emphasizes that training provides motivation as people may build their skills. Furthermore, Mentzer and Moon (2004, 42) conclude organizations often face problems with demand planning due to incompetent people. People that are involved in demand planning have normally little or no training in the subject. Additionally, demand side and supply side personnel in the case company must start learning to speak the same language. Since supply planning follows the demand planning step, it is of utmost importance these two sides understand one another.

Second issue in improving the process concerns the case company's sales department. It is critical that *sales managers adopt their leading role* in demand planning. They require training and motivation in order to commit themselves to the process. Sales managers in the case company already do realize they are the key persons holding up-to-date information about customers' future demand needs. However, they need to utilize this position more effectively and maintain customer relationships more aggressively. Crum and Palmatier (2003, 34), among others, agree that sales is required to provide insight about customer plans since they have the best forward-looking information concerning customer behavior. Thus, through strong relationship building, customers should be involved in the case company's demand planning process even more. It was concluded that in MTO environment demand uncertainty is even bigger a challenge than in MTS environment. Since most production lines in the case company use MTO strategy, most sales managers will face great difficulties in planning demand if they do not manage their customer relationships well. Furthermore, sales managers will have to adapt exploiting demand information sources more comprehensively and collect such information more systematically. In addition to historical demand information and forecasts received from customers, market research studies, competitor analyses, monthly or weekly follow-up of large offers and the database for projects should be looked into as well when demand plans are being prepared.

Third improvement issue is *creating the role of a demand planner*. Since such a role does not yet exist in the case company, description for this role may be created based on literature while constantly keeping in mind the suitability and benefits of such role to the case company. Barr (2002), for example, is a strong believer in the usefulness of demand planners as the researcher believes a demand planner is the driver for the entire forecasting process. Chase (2009, 46) explains demand planners mostly work in sales, marketing, financial or operations planning departments and are responsible for making necessary adjustments to statistical baseline forecasts. A demand planner should be able to determine where in the demand planning process inefficiencies occur and based on this, they should provide improvement suggestions. Chase (1998, 23, 25) explains further that the demand planner must oversee the preparation of several demand plans from

different departments and finally integrate them into one complete reporting format. In addition, the author suggested that the demand planner would be in charge of measuring forecast errors and communicating them to the necessary people. Further, the demand planner would need to take care the final demand plan is communicated to all relevant people, whether by placing the plan into the Intranet or someplace else. In any case, a demand planner would be a considerable asset for the case company. Together with sales department, they would lead the demand planning process.

Fourth issue is *training product management in adopting an active role*. This is a crucial step for the case company since in the current model product managements' participation is almost non-existent; they have adapted a strictly technical role. Business intelligence in the form of competitor analyses is not being shared with sales and thus, is not being used when preparing demand plans. In addition, the current attitude of product managers towards demand planning is that they need not to be a part of it. Such a mindset is extremely contradictory to literature as well as the wishes from other interviewees within the case company. Crum and Palmatier (2003, 34) indicate product management to be one key forward-looking function within a firm that should provide their expertise regarding competitors' product tactics and product pricing, to name a few. Such information need to be incorporated into the case company's demand planning process.

Fifth issue concerns *the business analyst and usage of market intelligence information.* When it comes to market research analyses, there is a clear distinction between how the case company operates at present state and what literature suggests being the most efficient way. In literature, it is widely acknowledged that business intelligence information in all forms is beneficial when planning for future demand. Market intelligence is, according to Hellriegel (2009, 13) and Fisher et al. (1994, 214), crucial to the development of an accurate forecast. However, most sales managers in the case company do not believe in such studies and thus, do not exploit them even though studies are being prepared. As a conclusion, cooperation between the business analyst and sales should be increased. Sales managers need to be trained using market research analyses in order to incorporate such information in their demand plans. In addition, requests to improve the usage of market studies from sales personnel need to be forwarded to the business analyst.

Sixth issue in the case company's demand planning improvement is *training the controller to adopt a supportive role.* Since now, the controller has only on rare occasions participated in the process. Thus, there are evident possibilities to increase the case company's controller's involvement. For instance, as Chase (2009, 40) argues, a controller might assess the revenue implications of sales and marketing activities. Additionally, LaVoie (2010, 12) suggests a controller to provide expertise in risk manage-

ment. In demand planning balancing risk with financial rewards may become relevant when turning the actual forecast into the demand plan (Croxton et al. 2002, 62).

Seventh issue relates to *the conception of sales budget.* Namely, sales budget should be viewed as a target and baseline, not operational guideline. This has, however, been the case in certain sales teams. Therefore, it is a matter of training sales managers to consider their customer specific sales budgets merely as goals. Kaipia and Holmström (2007, 3) explain in their study that there may be pressure to force the demand plan to match with the sales budget, or business plan, quite often. However, this is not a correct approach when reality shows that sales revenues will not most likely materialize at the rate presented in the business plan.

Eight noticeable issue includes *demand forecasting practices.* Firstly, a uniform demand forecasting process within sales needs to be implemented. Similarly, for example, Mentzer and Moon (2004, 43), Langabeer and Stoughton (2001, 7), and Mentzer et al. (1999) emphasize the importance of the whole process. All sales teams should be trained to forecast demand in a similar way and adapt to a monthly rhythm instead of quarterly. A generally acknowledged fact is (see e.g. Foster 2008, 3) that SOP will bring departments within a firm together and thus, assist in the forming of a uniform and consistent forecasting process. Additionally, as Lapide (2007b) among others indicated, demand and supply sides within a company do not often cooperate sufficiently. A starting point for better cooperation would be to find a common language that both sides may relate to. Thus, preparing both money and unit based demand forecasts will be an improvement towards mutual understanding. Further, a statistical forecasting method has been lacking in the case company. Finding a suitable statistical method, and even a software to assist, is bound to bring improvements and through this, more accurate demand forecasts may be created. The dependence on historical demand information in the current world's economic situation is not considered to be the smartest solution. Again, this conclusion is greatly supported by literature (see e.g. Gung, Leung, Lin & Tsai 2002; Helms et al. 2000, 394). Instead, in addition to historical sales information, future oriented demand data sources should be exploited as well. Lastly, a forecast accuracy measurement framework needs to be implemented into the case company. This measurement system will need to take all relevant levels into notice and should measure forecast errors in units. The author has concluded the following levels to be included in forecast accuracy measurement:

- product line specific, as has been already done
- country specific / certain area specific in sales team 1
- OEM customer specific in sales team 2
- regional accuracy measurement in sales team 3
- market area specific in sales teams 4 and 5
- sister factory specific.

MAPE is a commonly used and simple measure; it relates the forecast error to the demand level in a specific time period (Krajewski et al. 2009, 491, 498). Through extensive forecast accuracy measurement the case company will be able to identify targets for further improvement as well as see on what levels the process works well. Similarly to the author, Mentzer et al. (1999) have summarized the following key dimensions in effective sales forecasting management: functional integration, approach, systems and performance measurement. Functional integration consists of efficient communication, coordination and collaboration between different departments. The dimension of approach encompasses how forecasting is being approached and executed within a company. The system dimension refers to the specific software used in forecasting. The final dimension of performance measurement includes the metrics and gathered information used to determine the effectiveness and accuracy of forecasting. These dimensions summarize the key issues the case company should be focusing on with their forecasting practices.

Ninth issue is *increasing feedback and incentives*. Feedback within the firm as well as from trading partners can be considered as one key to the demand planning process's success. Giving positive feedback is a simple encouragement method and it gives people an incentive to continue performing well. (Rego 2011, 31–32.) Certain more tangible incentives would be appropriate to provide as well. The author concluded that the sales managers' accuracy in preparing the demand plans could be tied to a yearly bonus. Helms et al. (2000, 400), for instance, support such an idea. Crum and Palmatier (2003, 37–38), on the other hand, believe that when the demand side in the company sees that its inputs are useful and consider the demand plan as a request for products, they might become more active in providing input to the demand plan.

Tenth and final issue in improving the case company's demand planning process concerns *including key suppliers into the process*. Namely, such external supply chain partners may provide better insight and tactics to capture customers' future demand needs better. This step is crucial for advancing the process further and an extensively supported phase in literature (see e.g Reeder & Rowell 2001, 6). However, the author has concluded that suppliers need not to be included before the case company has implemented its own internal process well. Improvement towards advanced operations must begin from the inside.

All in all, companies may gain the most benefits when continuously being on the lookout for more efficient courses of action. Wallace and Stahl (2008, 19, 23) are strongly of the opinion that even though the process may be extremely challenging, it might nevertheless be the most important element in the SOP process. Lapide (2004, 17) continues that studies have been made which indicate that by fully embracing the use of the SOP process, companies can meet customer demand at the highest level, maintain reduced inventories and minimize supply chain operating costs. It is a com-

monly known fact that most organizations simply do not have the time to wait for demand to occur and then react to it with the right product in right amounts, in the right place at the right time. Instead, organizations are required to sense demand signals and shape demand, if possible, so that they can react immediately to customer orders. (Chase 2009, 21.) This statement is true in the case company's situation. Even though rapid reaction and operational flexibility are important qualities in the case company's business environment, creating an accurate and trustworthy demand plan in advance is nevertheless essential.

7.2 Suggestions for further research

As the first and most important suggestion, the author recommends testing for a suitable statistical forecasting method in the case company as a further research topic. Since this thesis focused mainly on the process of forecasting, it is only natural that another study would concentrate merely on the statistical part of demand forecasting. This way the case company would gain even better instructions for their demand planning activities. This research should also try to determining what the optimal level of integration between statistical and judgment based forecasting would be. Additionally, research on possible software system that would use the selected statistical forecasting method could be included into this study as well.

Secondly, it is well acknowledged that usage of POS data would advance the demand planning process further. In the technology industry, however, this sort of demand information is extremely difficult to obtain. In order to discover an efficient and practical way of using POS data in the case company, more thorough analysis on the subject of POS data usage in the case company's situation is required. Thirdly, the author suggests for further research the topic of involving the case company's key suppliers into the demand planning process. It would be worthwhile to study possible solutions that might bring key suppliers more involved in the case company's demand planning process. Since such research takes time, the case company is able to slightly, at least, improve their processes in the meantime.

8 SUMMARY

DM is the concept that covers all supply chain processes aiming to match demand with supply. However, the definition is still evolving as it is still seen as a complex concept. Nervousness in planning and especially uncertainty regarding future demand affect how well a company is able to manage its DM activities. Demand uncertainty is regarded as one of the reasons why many organizations keep safety stocks and increase operational flexibility. A best practice nowadays, the SOP process, is one process within DM. It brings balance between an organization's demand and supply sides by efficiently synchronizing demand and supply plans. Demand planning is a process within DM as well as within supply chain planning, and it is often considered as the starting phase in SOP. The purpose of demand planning is to collect all necessary information on future demand resulting in the creation of a demand plan; the first step in matching demand with supply. Forecasting is an important component in demand planning, as through forecasting a company is able to receive a quantitative assessment about the upcoming demand. Demand planning processes in MTS and MTO environments do not differ from one another significantly. Therefore, even though the case company uses both manufacturing strategies, they were not discussed separately in the empirical part. Only issue worth mentioning is that demand uncertainty is experienced more greatly in MTO production lines. The research problem in this thesis was *to identify improvement suggestions in the demand planning process for stable products which may assist the case company to achieve a more accurate demand plan.* The research problem was divided into the following two specifying questions:

1) *How does the demand planning process work currently with stable products in the case company?*
2) *How can the demand planning process be improved in order for the case company to achieve a more accurate demand plan?*

In demand planning research literature, generally acknowledged success factors that contribute to a more efficient demand planning process were found. These were further converted into improvement suggestions for the case company. As first and foremost important issue, the need for training all people involved in the demand planning process became evident. People in the case company do not understand well what constitutes demand planning as until now demand planning is equated with demand forecasting. Secondly, contrary to current situation, all sales managers need to adjust to their leading role in demand planning. Therefore, they require training and motivation in order to truly commit themselves to the process. Additionally, they must devote to even stronger customer relationship building and managing, as well as more comprehensive

usage of demand information sources. Thirdly, a role of a demand planner should be created. Together with sales department, they would lead the demand planning process. As a fourth issue, product management should be encouraged and trained in adopting an active role when planning demand. After all, they should be the experts regarding a product's status within the competitive environment. In the current model product managements' participation is nearly non-existent. Thus, their attitude and mindset towards demand planning must be changed. The fifth issue regards the business analyst and through this, the entire business intelligence function. Namely, this function will need to become more involved in demand planning as until now, market research analyses have been minimally exploited. Thus, there is much room for improvement regarding the usage of such information.

As sixth, the case company's controller needs to be trained to adopt a supportive role. This role would entail, for instance, expertise in risk management when required. The seventh issue emphasizes the conception on the prepared sales budgets. Namely, a sales budget should be viewed as the baseline and target for operations, not the guiding factor. The eight issue concerns the demand forecasting practices. In order to gain improvement, the case company will need to focus on the process itself, finding proper statistical forecasting methods, exploiting demand information sources more comprehensively and establishing a forecast accuracy measurement system. As the ninth issue, feedback and suitable incentives are key factors in successful demand planning. Thus, the case company is urged to increase both encouragement methods in ways that suit the company's objectives. As tenth and final issue, it is recommended to include key suppliers into the process. However, this step becomes relevant only when the case company has implemented its own internal process well. Improving demand planning is often described as an endless battle. Nevertheless, as this research has revealed, demand planning is recognized to be a key driver of business performance. Once the process gains its full potential, the outcome in the form of a single demand plan will be a trustworthy and directive guideline for operations. Without a doubt, advancing the case company's demand planning process according to the presented improvement suggestions will be worth all the effort.

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APPENDICES

Appendix 1: Interview outline

Background information

Date:

Name of the interviewee:

How long have you worked in this company?

Please describe your role and responsibilities in the company.

Interview questions on demand management, demand planning and demand forecasting

1. What actions are you / is your team taking to assist in matching supply and demand?
   (For example: information sharing, demand forecasting, managing demand variability, increasing flexibility, demand planning,…)

2. From your point of view, please describe the challenges with demand supply matching.
   (For example: risks & uncertainties related to demand, supply, the environment, internal processes,…)

3. How are the demand plans integrated with the supply side?
   (For example: in meetings with people from sales department and supply side, IT-programs,…)

4. In your opinion, what could be improved in the process of matching supply with demand?
   (For example: more people involved, more actions to be taken, more emphasis on some actions,…)

5. From your point of view, what does the term demand planning mean?

6. Is there currently an implemented demand planning process?

    a. In your opinion, who participate currently and who should participate in demand planning?
    b. How would you describe your department's role in demand planning?
    c. When does your department cooperate with the sales teams when planning demand?
    d. What information is being used when planning demand and where does this information come from?

    e. Is this information accurate enough to understand demand?

7. What do you consider to be the biggest source of demand?

8. Is there noticeable seasonality in the demand for the company's products?

9. In your opinion, has there been a visible trend in the demand for the products during this year?

10. In your opinion, what information should the sales department provide in order to contribute to the understanding of demand?

11. Where/from whom does the company receive the necessary market intelligence?

    a. How is the market information being used and to what purposes?
    b. Can you think of improvement possibilities on how the market information could be used?

12. In your opinion, what factors create turbulence in the sales department?
    (For example: sister factories, OEM customers, product introductions,…)

    a. What is the biggest cause of turbulence?
    b. When regarding the sister factories as regular customers, how do they cause problems and turbulence?
    c. From your point of view, how can the turbulent causing factors be reduced?

13. Please describe the process to forecast demand in the company.
    (For example: the way in which the forecast is created, time frames, people involved, meetings,…)

    a. Where does the required information for forecasting come from?
    b. Is the used information reliable and accurate enough?

14. In your opinion, during this and previous year, have the forecasts and the actual demand deviated from one another by much?

15. How are the forecast errors used to enhance the forecasting procedures?
    (For example: are they communicated widely across the organization, are they used as an opportunity to learn,…)

16. Do you have any suggestions on how to improve the current demand planning process?
    (For example: more sources of information, more accurate information, faster information updates, more people, involve the customers more, more organized meetings, more time reserved for planning,…)

Appendix 2: Response distribution

Question	Logistics manager 1	Logistics manager 2	Production director	Sales manager 1	Sales manager 2	Sales manager 3	Sales manager 4	Sales manager 5	Production manager 1	Production manager 2	Business analyst	Sourcing manager	Product manager	Demand manager in customer organization
1.	x	x	x	x	x	x	x	x	x	x	x	x	x	x
2.	x	x	x	x	x	x	x	x	x	x	x	x	x	x
3.	x	x	x	x	x	x	x	x	x	x	-	*	*	x
4.	x	x	x	x	x	x	x	x	x	x	*	x	*	*
5.	x	x	x	x	x	x	x	x	x	x	x	x	x	x
6.	x	x	x	x	x	x	x	x	x	x	-	x	x	x
a)	x	x	x	x	x	x	x	x	x	x	-	x	x	x
b)	*	*	*	*	*	*	*	*	*	*	-	*	x	*
c)	*	*	*	*	*	*	*	x	*	*	-	*	x	*
d)	*	x	x	x	x	x	x	x	*	*	-	x	x	x
e)	*	x	x	x	x	x	x	x	*	*	-	*	x	x
7.	x	x	*	x	*	x	*	x	x	x	*	*	*	*
8.	x	x	x	x	x	*	*	*	x	x	*	*	*	*
9.	*	x	*	x	x	x	x	x	*	*	*	*	*	*
10.	x	x	x	x	x	x	x	x	x	x	x	x	x	x
11.	-	*	x	x	x	x	x	x	*	*	x	x	x	x
a)	-	*	x	x	x	x	x	x	*	*	x	x	x	x
b)	-	*	x	x	x	x	x	x	*	*	x	x	x	x
12.	x	x	x	x	x	x	x	x	x	x	x	-	*	*
a)	x	x	x	x	x	x	x	x	x	x	x	*	*	*
b)	x	x	x	x	x	x	x	x	x	x	x	*	*	*
c)	x	x	x	x	x	x	x	x	x	x	*	*	*	*

13.	x	x	x	x	x	x	x	x	x	x	*	x	x	x
a)	x	x	x	x	x	*	*	x	x	x	*	x	*	x
b)	x	x	x	x	x	*	*	x	*	*	*	x	*	x
14.	x	x	x	x	x	*	*	*	x	x	*	x	*	x
15.	x	x	x	x	x	x	x	x	x	x	*	x	*	x
16.	x	x	x	x	x	x	x	x	x	x	-	x	x	*

x respondent was capable of answering the question

\- respondent was not capable of answering the question

* the question was not presented to the respondent